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A BIBLIOGRAPHY OF NICOTINE

PART II

THE INSECTICIDAL USES OF NICOTINE AND TOBACCO

BY N. E. McINDOO, senior entomologist, Division of Control Investigations, R. C. ROARK, principal chemist, and Mrs. R. L. BUSBEY, junior chemist, Division of Insecticide Investigations

SECTION 3

Washington, D. C.
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PART II. THE INSECTICIDAL USES OF NICOTINE AND TOBACCO

By N. E. McIndoo, senior entomologist, Division of Control Investigations, R. C. Roark, principal chemist, and Mrs. R. L. Busbey, junior chemist, Division of Insecticide Investigations, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

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N. LEPIDOPTERA, 1813-1934

1. Grapevine Moths, 1870-1933

REGEL, E. (Ed.) (1534)

1870. WEINKRANKHEITEN. Gartenflora 19: 87-88.

Bunches of grapes infested with the caterpillars of the grapevine moths are dipped in a decoction, made by using 1/2 lb. tobacco in 6 l. of water. The caterpillars soon die and there is no bad effect on the grapes.

NESSLER, DR. (1535)

1885. ZUR BEKÄMPFUNG DES HEU- ODER SAUERWURMES. Gartenflora 34: 315-316.

The following mixture was found effective against the larvae of the vine moths: 21 g. soft soap, 16 g. or 20 cc. fusel oil, 15 g. tobacco, and 1 l. water (p. 316).

GRUVEL, A. (1536)

1906. EXPÉRIENCES CONTRE LE COCHYLIS ET L'EUDÉMIS. Bull. Soc. Études et Vulg. Zool. Agr. 5 (6): 173-176.

Against the vine moths a spray mixture, consisting of 1,000 g. titrated nicotine and 100 l. water, has given satisfactory results in France.

CAPUS, J., and FEYTAUD, J. (1537)

1907. EXPÉRIENCES CONTRE L'EUDÉMIS. Bull. Soc. Études et Vulg. Zool. Agr. 6 (4): 106-114.

Five titrated nicotine spray mixtures were tested against Eudemis. The first consisting of 1 kg. nicotine, 10 kg. lime, and 100 l. water, gave a mortality of 43 percent. The second containing 1 kg. nicotine, 1 kg. glucose, and 100 l. water, gave a mortality of 55 percent. The third containing 1 kg. nicotine, 2 kg. copper sulphate, 1 kg. lime, and 100 l. water, gave a mortality of 59 percent. The fourth consisting of 1.33 kg. nicotine, 2 kg. copper sulphate, 1 kg. lime, and 100 l. water, gave a mortality of 68 percent. And the fifth, consisting of 1 kg. nicotine, 1 kg. copper sulphate, 0.5 kg. sodium carbonate, and 100 l. water, gave a control of 96 percent in the cleaned lot and 79 percent in the uncleaned lot.

-------- and FEYTAUD, J. (1538)

1908. EXPÉRIENCES CONTRE L'EUDÉMIS. Prog. Agr. et Vitic. 50: 77-87.

Against the vine moths the following spray mixture is recommended: 1 kg. titrated nicotine, 1.33 kg. copper sulphate, 0.33 kg. sodium carbonate, and water to make in all 100 l. Another similar mixture has the nicotine increased to 1.33 kg. The percentages of larvae killed are 68, 72, and 79.

FEYTAUD, J. (1539)

1909. LES TRAITEMENTS DE PRINTEMPS ET D'ÉTÉ CONTRE L'EUDÉMIS. Bull. Soc. Étude et Vulg. Zool. Agr. 8 (1): 12-30; 8 (2): 51-61.

In all, 8 nicotine spray mixtures were used in the spring against *Eudemis*. The percentages of mortality were 67, 52, 78, 82, 84, 60, 57, and 45 (p. 20, 21, 26). As summer applications, 6 nicotine spray mixtures were used with the following percentages of mortality: 43, 45, 55, 60, 71, and 73.

CAPUS, J., and FEYTAUD, J. (1540)

1910. LA LUTTE CONTRE L'EUDÉMIS ET LA COCHYLIS. Rev. Vitic. 33: 291-294.

In one observation of 100 grapes which had been sprayed with nicotine, only 8 to 13 were infested with the eggs of vine moths, whereas the authors counted as many as 168 eggs on 100 grapes which had not been treated. Nicotine acted, therefore, as a repellent to the moths and deterred oviposition.

When grape vines were sprayed with a mixture, consisting of 1.33 kg. nicotine per 100 l. bordeaux solution, practically all of the eggs failed to hatch.

CAPUS, J. (1541)

1911. ESSAIS DE TRAITEMENTS INSECTICIDES EXTERNES. Rev. Vitic. 36: 10-11.

A spray mixture, consisting of 133 g. nicotine, 3 kg. soap, and 100 l. water, killed 83 percent of the larvae of *Eudemis* and 57 percent of *Cochylis*. Another mixture, consisting of 133 g. nicotine, 3 kg. soap, 3 l. kerosene and 100 l. water, killed 99 percent of *Eudemis* and 100 percent of *Cochylis*.

VERMOREL, V., and DANTONY, E. (1542)

1911. LA NICOTINE MOUILLANTE. Prog. Agr. et Vitic. 55: 772-773.

Against the vine moths in France the following spray mixture was very effective: 1.3 l. titrated nicotine (10-percent), 100 g. Solvay sodium carbonate, 200 g. white oleime soap, and 100 l. water.

CAPUS, J. (1543)

1912. DE L'EUDÉMIS ET DE LA COCHYLIS EN 1911. Rev. Vitic. 37: 773-778.

Against the larvae of vine moths nicotine arsenate was used. The mixture always contained 21 percent metallic arsenic, but the nicotine ranged from 1 to 0.025 g. per l. The effectiveness against

Cochylis ranged from 31 to 79 percent, distinctly showing the effect of the increased nicotine concentration. The effectiveness against Eudemis ranged from 81 to 91 percent, but the nicotine seems to have had no effect.

MOIZ, E. (1544)

1913. CHEMICAL MEANS OF COMBATING PESTS OF CULTIVATED PLANTS. Ztschr. Angew. Chem. 26 (77 and 79): 533-536, 587-588. [In German. Abstract in Rev. Appl. Ent. (A) 2: 209-211. 1914.]

Nicotine is an important ingredient in many insecticides. In the form of tobacco extract it is an important contact poison; more recently it has been found to be an efficient stomach poison and has been used successfully against Clysia ambiguella and Polychrosis botrana.

REUTLINGER (1545)

1913. A SUCCESSFUL METHOD OF COMBATING THE VINE-MOTH. Weinbau der Rheinpfalz, Neustadt a. Hdt. 1 (24): 308-311. [In German. Abstract in Rev. Appl. Ent. (A) 2: 182. 1914.]

The grubs were successfully controlled by using the following formula: (a) 2 gal. water, 1 lb. soft soap, 1 lb. fusel oil, and 1 1/2 oz. raw nicotine (98-percent); or the alternative formula: (b) 2 gal. water, 1 lb. soft soap, 1 lb. methylated spirit, and 1 lb. tobacco extract.

ANONYMOUS (1546)

1914. STATE AID IN COMBATING VINE PESTS IN LUXEMBURG. Luxemburger Weinztg. 2 (7): 98-100, April 1. [In German. Abstract in Rev. Appl. Ent. (A) 2: 537. 1914.]

By paying a surcharge of from 2 to 5 percent, according to their tax assessment, non-members of the Vinegrowers Union are permitted to purchase insecticides at the same prices as members. The following maximum quantities per quarter acre may not be exceeded: For the first and second generations of Clysia ambiguella Hb. each: nicotine 5 lb., copper sulphate 3 1/4 lb., soap 1 1/2 lb.

CIMATTI, V. (1547)

1914. L'USC DELLA NICOTINA IN AGRICOLTURA. Riv. Agr. 20: 489-490.

Against vine moths the following spray mixture is recommended in Italy: 140 g. nicotine, 100 g. sodium carbonate, 300 g. soap, and 100 l. water. Against aphids the following spray mixture is recommended: 100 g. nicotine, 1,000 g. sodium carbonate, 1,000 g. black soft soap, 1,000 cc. wood alcohol, and 100 l. water.

ESMENARD, G. (1548)

1914. THE VINE MOTHS. OBSERVATIONS AND EXPERIMENTS IN THE ALTO CANAVESE REGION. Consigliere Agr. [Turin] 2 (6): 190-194. [In Italian.

Abstract in Rev. Appl. Ent. (A) 2: 635. 1914.]

Satisfactory results were attained in the control of Clysia ambiguella and Polychrosis botrana with ordinary bordeaux mixture to which from 1 1/2 to 2 percent of tobacco extract had been added. Spraying against the first generation was carried out between May 25 and June 2 and against the second between the 16th and 20th July. In a vineyard at Ivrea 8.57 percent of treated grapes and 53.66 percent of untreated ones were injured, the other conditions being equal. At Palazzo the figures were 17.6 and 34.1 respectively in one vineyard, and 8 and 16 in another. Neither leaves nor grapes were scorched except in one instance where an overdose of nicotine had been used, nor was the flavor of grapes or wine affected. Nicotine is always preferable to arsenicals which should never be used after the middle of July.

F., P. (1549)

1914. THE EFFECT OF NICOTIN USED AGAINST CLYSIA AMBIGUELLA ON THE TASTE OF MUSTS AND WINES. Luxemburger Weinztg. 2 (14): 228-230, July 15. [In German. Abstract in Rev. Appl. Ent. (A) 2; 682. 1914.]

Authorities are quoted to show that a carefully prepared nicotine spray applied at the proper time communicates no taste to musts and wines, at any rate when copper sulphate is nearly or entirely absent. The spray solution should therefore contain only nicotine and soap.

SCHILLING, K. (1550)

1914. COMBATING THE VINE-MOTH. Luxemburger Weinztg. 2 (2): 28-30. 1914. [In German. Abstract in Rev. Appl. Ent. (A) 2: 239-240. 1914.]

Nicotine-soap gave very fine results. The spray was made up of 20 gal. of a 1/2-percent lime-copper-sulphate solution, 4 1/2 oz. of 90-percent purified nicotine and 2 lb. of soft soap. Nicotine-soap is mainly a control of the second generation and must be applied immediately after the moth flight is over.

V., C. (1551)

1914. I PREPARATI INSETTICIDI NELLA DIFESA DELLE PIANTE. Riv. Agr. 20: 378-379.

Against leaf-eating caterpillars on apple trees the following spray mixture is recommended: 200 g. nicotine, 500 g. sodium carbonate, 200 g. soap, and 100 l. water. Against the vine moths the following spray mixture is recommended in Italy: 1 l. nicotine (10-percent), 200 g. sodium carbonate, 200 g. white soap, and 100 l. water.

VOGLINO, P. (1552)

1914. POLYCHROSIS BOTRANA AND CLYSIA AMBIGUELLA IN PIEDMONT IN 1913. Osserv. Consorziale Fitopat. in Torino [Turin], 35 pp. [In Italian. Abstract in Rev. Appl. Ent. (A) 2: 666-667. 1914.]

Bordeaux mixture with 2 to 2.5 percent of tobacco extract was an effective dressing, but the addition of 1 percent of sodium carbonate to plain tobacco extract was a more efficient dressing. Tobacco dust had no effect upon the larvae of vine moths. Lead arsenate against the first generation of larvae is likely to give the best results until a reliable standard of nicotine extract can be obtained. During July and August it is better to use tobacco extract, 2 to 2.5 percent, as it acts as an insectifuge and avoids the difficulties of arsenate.

WAHL, C. V., and MULLER, K. (1553)

1914. THE REPORT OF THE CHIEF PLANT-PROTECTION STATION IN BADEN, AT THE AUSTENBERG AGRICULTURAL EXPERIMENT INSTITUTE OF THE GRAND DUCHY FOR 1913. Stuttgart, 70 pp. [In German. Abstract in Rev. Appl. Ent. (A) 2: 499-501. 1914.]

Against vine moths (Clysia ambiguella and Polychrosis botrana) efficient results are obtained by thorough spraying with nicotine, applied at the right moment. In one case good results were obtained with a spray containing 11 lb. of Muth's compound, 8 3/4 lb. nicotine and 8 3/4 lb. soft soap. Against Aphis mali, solutions of soft soap and nicotine or quassia were efficacious where the leaves had not curled too much. Abraxas grossulariata and Nematus were effectively controlled with tobacco dust and basic slag. Phorodon humuli was controlled with applications of nicotine and soft soap.

ZSCHOKKE, K. (1554)

1914. REPORT ON THE OCCURRENCE AND CONTROL OF VINE PESTS IN THE PALATINATE IN 1913. Weinbau der Rheinpfalz 2 (8): 86-90. [In German. Abstract in Rev. Appl. Ent. (A) 2: 538-539. 1914.]

Bait sprays were practically abandoned as being ineffective and costly; and sprays, especially of tobacco extract, were chiefly resorted to. This was made up of 1 lb. soft soap and 1.5 lb. tobacco extract (10 percent nicotine) in 10 gal. water. The best results were obtained where both generations of Clysia ambiguella and Polychrosis botrana were sprayed. Nicotine spray retards ripening of the grapes, but it is thought that by reducing the amount of soap this defect may be remedied. When used even against the second generation nicotine spray does not impart a bad flavor to the wine.

RAVAZ, L., and OBIEDOFF, S. (1555)

1915. EXPERIMENTS IN CONTROLLING CLYSIA AMBIGUELLA AND POLYCHROSIS BOTRANA. Prog. Agr. Vitic. [Montpellier] 64 (49): 540-547, illus. [In French. Abstract in Rev. Appl. Ent. (A) 4: 78-79. 1916.]

In France 2 plots in a vineyard were treated with insecticides and 1 plot was kept as a control. The first plot was treated with bordeaux mixture to which 1/10 percent of nicotine had been added. In the second, bordeaux mixture was used with the addition of 1/4 percent of lead arsenate. From all points of view the lead arsenate proved its superiority, and nicotine occupied a second place.

VOGLINO, P. (1556)

1916. THE LIFE HISTORY AND CONTROL OF THE VINE MOTHS, CONCHYLIS AMBIGUELLA AND POLYCHROSIS BOTRANA: OBSERVATIONS MADE IN 1914 BY THE PLANT DISEASE OBSERVATORY OF TURIN, ITALY. Internatl. Rev. Sci. and Pract. Agr., Monthly Bull. Agr. Intel. and Plant Diseases [Rome] 7 (6): 906-908. [Abstract in Rev. Appl. Ent. (A) 5: 31-32. 1917.]

A 2 percent nicotine solution gave good results in some localities. A 2 percent tobacco extract gave good results against the second generation, but the most effective remedy against the larvae of the first generation is lead arsenate. Though tobacco extract is recommended, it is at present very costly and its nicotine content is variable. Its use may result in scorching.

GUENAUX, G. (1557)

1917. SPRING AND SUMMER TREATMENTS FOR CLYSIA AMBIGUELLA AND POLYCHROSIS BOTRANA. Vie Agr. et Rurale 7 (22) 397-398. [In French. Abstract in Rev. Appl. Ent. (A) 5: 351. 1917.]

Spraying in spring with lead arsenate is recommended for the control of Clysia ambiguella and Polychrosis botrana. In summer nicotine is used. The formula recommended is ordinary bordeaux mixture 20 gal., titrated extract of nicotine 1 1/8 pt., ordinary soap, 4 lb. Barium chloride may be used instead of the nicotine.

TOPI, M. (1558)

1917. NEW CONTROL EXPERIMENTS AGAINST THE VINE MOTHS. Minerva Agr. [Milan] 9 (13-14): 167. [In Italian. Abstract in Rev. Appl. Ent. (A) 5: 485-486. 1917.]

Vines were sprayed with a solution of 2 percent tobacco extract and 0.2 percent soft potash soap. The reduction in the number of larvae ranged from 71 to 85 percent. Other insecticides were also used, but it was concluded that the vine moth control was not entirely solved.

MAZIÈRES, A. DE (1559)

1918. ENQUETE SUR L'EUDÉMIS. Rev. Hort. Algérie 22 (3): 35-39. [Abstract in Rev. Appl. Ent. (A) 6: 273. 1918.]

For the control of the vine moths Polychrosis botrana and Clysia ambiguella two treatments are used, namely, two sprayings in spring with arsenicals and a summer treatment with nicotine. Summer treatment begins as soon as the grapes begin to develop; for this nicotine should be mixed with a copper solution.

MÜLLER-THURGAU, H. (1560)

1918. NOTES ON COMBATING THE FIRST AND SECOND GENERATIONS OF THE VINE MOTH, CLYSIA AMBIGUELLA IN SUMMER. Schweiz. Ztschr. Obst. u. Weinbau 27 (11): 165-170. [Abstract in Rev. Appl. Ent. (A) 6: 381. 1918.]

The use of arsenicals is deprecated in favor of nicotine. Spraying against the second generation should take place about 8 days after the chief flight. The solution should contain a minimum of 0.13 percent nicotine and though the addition of 1 percent soap may permit a less amount to be used such a reduction is not advised. Bordeaux mixture may be used as a carrier.

FEYTAUD, J. (1561)

1919. EXPERIMENTS IN LATE ARSENICAL TREATMENTS AGAINST POLYCHROSIS BOTRANA. Ann. Serv. Epiphyties 6 (1918): 313-319. [Abstract in Rev. Appl. Ent. (A) 9: 27. 1921.]

The efficacy of arsenicals against the second generation is very inferior to that of a preventive nicotine treatment made toward the end of July. It is suggested that an arsenical or nicotine preventive treatment be given before the blossoming to destroy the eggs and larvae of the first generation, this being followed by a preventive nicotine treatment against the eggs and larvae of the second generation.

FAES, H. (1562)

1920. LA LUTTE CONTRE LE VER DE LA VIGNE (COCHYLIS) EN 1919. Terre Vaudoise 12 (25): 240-242. [Abstract in Rev. Appl. Ent. (A) 8: 400. 1920.]

The best means of combating Clysia ambiguella in the canton of Vaud consists in spraying the first generation of caterpillars with pyrethrum soap and then spraying the eggs laid by the second generation adults with nicotine.

LÜSTNER, G. (1563)

1920. THE SCIENTIFIC AND PRACTICAL EXPERIMENTS HITHERTO MADE IN THE PRUSSIAN VINE-GROWING DISTRICTS FOR THE PURPOSE OF CHECKING THE FIRST AND SECOND GENERATIONS OF THE VINE MOTHS. Centbl. Bakt. Parasitologie u. Infectionskr. 2 Abt., 50 (1-4): 88-175. [In German. Abstract in Rev. Appl. Ent. (A) 8: 522. 1920.]

Nicotine (1 to 1 1/2 percent) is of practical value on a large scale for the control of the vine moths Clysia ambiguella and Polychrosis botrana. Tobacco dust was less effective than the liquid extract. Nicotine soap is more effective against the second génération than against the first. Its use does not give any unpleasant taste or smell to the grapes.

STELLWAAG, F. (1564)

1920. ARSENIC PREPARATIONS AGAINST PESTS OF VINES AND FRUIT TREES. Ztschr. Angew. Ent. 7 (1): 172-180. [In German. Abstract in Rev. Appl. Ent. (A) 9: 2-3. 1921.]

In 1917 the supplies of nicotine were just sufficient to spray against the first generation of the vine moths (*Clysia ambiguella* and *Polychrosis botrana*); and vine growers resorted to arsenicals against the second generation with great success and without untoward consequences.

—————— (1565)

1920. REPORTS ON THE OCCURRENCE AND CONTROL OF INSECT PESTS OF VINEYARDS IN 1918 AND 1919. Ztschr. Angew. Ent. 7 (1): 192-196. [In German. Abstract in Rev. Appl. Ent. (A) 9: 4. 1921.]

In 1918 the second generation of the vine moths (*Clysia ambiguella* and *Polychrosis botrana*) was combatted with arsenicals, nicotine having been used against the first generation. Mites (*Phyllocoptes* and *Epitrimerus vitis* Nal.) were treated with nicotine-soap in the spring with satisfactory results.

ANONYMOUS (1566)

1921. AGAINST VINE MOTHS. Riv. Agr. [Parma] 26 (17): 241-242, April 29. [In Italian. Abstract in Rev. Appl. Ent. (A) 9: 342. 1921.]

The best treatment against vine moths, (*Clysia ambiguella* and *Polychrosis botrana*), consists in a spray of lead arsenate before flowering and one or two of nicotine after flowering for the second generation.

MÜLLER-THURGAU, H. (1567)

1921. THE USE OF LEAD ARSENATE AGAINST THE FIRST AND SECOND GENERATION OF *CLYSIA AMBIGUELLA* AND *POLYCHROSIS BOTRANA*. Schweiz. Ztschr. Obst. u. Weinbau 30 (13): 198-200. [Abstract in Rev. Appl. Ent. (A) 9: 427. 1921.]

Lead arsenate should be used only for spring spraying against vine moths and should be prohibited in July and August on the bunches. Nicotine which is the substitute in the later work has many disadvantages; it delays ripening and tends to impart a disagreeable flavor.

SCHELLENBERG, A. (1568)

1921. A REPORT ON A TOUR OF STUDY IN THE GERMAN VINE-GROWING REGIONS. Landw. Jahrb. Schweiz, [Lucerne] 35 (6): 725-754, illus. [In German. Abstract in Rev. Appl. Ent. (A) 10: 185. 1922.]

As nicotine has risen to about forty times its pre-war price in Germany, arsenicals are being used to control the vine moths.

DALMASSO, G. (1569)

1922. WORK AGAINST THE VINE MOTHS. 86 pp., illus. Casale Monferrato. [In Italian. Abstract in Rev. Appl. Ent. (A) 10: 220. 1922.]

About 8 - 10 days after the maximum number of moths [Clysia (Conchylis)ambiguella Hb. and Polychrosis (Eudemis)botrana Schiff.] has been noticed a first spraying is required with bordeaux mixture containing 1 percent of lead arsenate or 3 percent of a tobacco extract containing 5 percent nicotine. About 10 days later a second treatment similar to the first must be made. Two sprayings, 10 days apart, are again made in July.

FAES, H., and STAEHELIN, M. (1570)

1922. LES TRAITEMENTS CONTRE LA COCHYLIS (VER DE LA VIGNE) EN 1921. Ann. Agr. Suisse 23 (1): 17-25. [Abstract in Rev. Appl. Ent. (A) 10: 320. 1922.]

The tests described confirm the efficacy of pyrethrum-soap and nicotine-copper sprays against Clysia ambiguella. The difficulty of determining the appropriate moment for nicotine treatment makes the pyrethrum-soap spray preferable against the larvae of the first generation; nicotine on the other hand is indicated for the destruction of the eggs laid by the second generation.

STELLWAAG, F. (1571)

1922. ARSENICALS, VITICULTURE AND PLANT PROTECTION. Ztschr. Angew. Ent. 8 (2): 427-436, illus. [In German. Abstract in Rev. Appl. Ent. (A) 10: 500. 1922.]

Nicotine sprays proved very useful against vine moths (Clysia ambiguella Hb. and Polychrosis botrana Schiff.). By 1915 nicotine was proved to be effective against both the spring and summer generations of the vine moths, but by 1917 tobacco products were too costly and almost unobtainable, and it became necessary to find a cheap and effective insecticide. Arsenicals cost only a small fraction of that of nicotine, can be incorporated in lime-copper spray, and satisfy all requirements.

GESSNER (1572)

1923. THE FIRST AND SECOND GENERATIONS OF VINE MOTHS IN BADEN IN 1922-23 AND THEIR CONTROL. Badische Blätter f. Schädlingsbekämpfung 1 (1): 4-8, illus. [Abstract in Rev. Appl. Ent. (A) 12: 340. 1924.]

Nicotine is considered to be the best insecticide for the vine moths Clysia ambiguella Hb. and Polychrosis botrana Schiff.

JEGEN, G. (1573)

1923. CONTRIBUTIONS TO A KNOWLEDGE OF THE SPRING AND SUMMER GENERATIONS OF VINE MOTHS AND THEIR CONTROL WITH PARTICULAR REGARD TO ARSENICAL COMPOUNDS. Schweiz. Ztschr. Obst. u. Weinbau 32 (2-6): 30-35, 49-53, 65-69, 79-84, 97-98, illus. [In German. Abstract in Rev. Appl. Ent. (A) 11: 255. 1923.]

Nicotine has been largely used, but if the summer generation is to be checked it is necessary to spray the bunches and this insecticide may delay ripening and affects the flavor.

CONSOLANI, G., and DALMASSO, G. (1574)

1924. A BRILLIANT SUCCESS IN THE WORK AGAINST VINE MOTHS. Contadino della Marca Trevisana. Reprint, 14 pp., illus. [In Italian. Abstract in Rev. Appl. Ent. (A) 12: 339. 1924.]

Calcium arsenate controlled the spring generation of Polychrosis botrana Schiff. so effectively that very little spraying with nicotine (3-percent solution) was needed for the second generation.

VINET, E., et al. (1575)

1924. THE FIGHT AGAINST THE VINE MOTH IN ALGERIA. Rev. Agr. Afr. Nord. 22 (241): 161-176, illus. [Algiers] [In French. Abstract in Rev. Appl. Ent. (A) 12: 195. 1924.]

The spring treatment of sodium arsenate should begin as soon as the moths (Polychrosis botrana Schiff.) begin to fly, 2 or 3 applications being made before the flowering of the vine, and should be followed by sprays of copper sulphate and nicotine or of pyrethrum-soap solution directed against the eggs and larvae of the 2nd and 3rd generations.

GORJAT, R. (1576)

1925. ÉTUDE COMPARATIVE DES DIFFERENTS MOYENS DE LUTTE CONTRE LES VERS DE LA VIGNE. Terre Vaudoise 17 (52): 767-769; 18 (1 and 2): 9-10, 21-23. [Abstract in Rev. Appl. Ent. (A) 14: 117. 1926.]

Disbudding should be practised before the treatment against the first generation of vine moths (Clysia ambiguella Hb. and Polychrosis botrana Schiff.) with nicotine or pyrethrum. For use against the second generation an insecticidal powder to supplement nicotine treatment is needed.

MARTELLI, G. (1577)

1925. THE VINE MOTH, POLYCHROSIS BOTRANA SCHIFF. R. Osserv. Fitopat. per le Puglie Circ. 4, 3 pp. [In Italian. Abstract in Rev. Appl. Ent. (A) 13: 266-267. 1925.]

Following applications of lead arsenate, a third spray containing 2 percent tobacco extract and 1 percent soap should be applied in the middle of July if necessary.

BERRO, J. M. (1578)

1925. THE CATERPILLAR OF GRAPES FOR EXPORT, POLYCHROSIS BOTRANA SCHIFF. Estac. Pat. Veg. Almeria, Divulgacion, 56 pp. [In Spanish. Abstract in Rev. Appl. Ent. (A) 15: 121-122. 1927.]

Lead arsenate is recommended for use against the first generation and a spray of 1 lb. 40-percent nicotine sulphate and 80 gal. bordeaux mixture is advised against the second generation.

MOREAU, L., and VINET, E. (1579)

1926. LA LUTTE CONTRE LA COCHYLIS ET L'EUDÉMIS. COMMENT RÉDUIRE EN NOMBRE ET EN IMPORTANCE LES GRANDES INVASIONS. Compt. Rend. Acad. Agr. France 12 (12): 400-404. [Abstract in Rev. Appl. Ent. (A) 14: 214-215. 1926.]

Lead arsenate has proved more popular than nicotine or pyrethrum-soap for the control of the vine moths Clysia ambiguella Hb. and Polychrosis botrana Schiff.

SPRENGEL, L. (1580)

1926. THE OUTBREAK OF A VINE PEST (CLYSIA AMBIGUELLA HUBN.) IN THE PALATINATE. Anz. Schädlingsk. 2 (1): 1-5, illus. [In German. Abstract in Rev. Appl. Ent. (A) 14: 136. 1926.]

Nicotine and arsenical sprays were used, and it was proved that if an arsenical spray be applied at the proper time, it produces excellent results.

FAES, H., and STAEHELIN, M. (1581)

1927. LA LUTTE CONTRE LES PARASITES, INSECTES ET CHAMPIGNONS DE LA VIGNE EN 1925 ET 1926. Ann. Agr. Suisse 28 (4) 373-396, illus. [Abstract in Rev. Appl. Ent. (A) 16: 169. 1928.]

The sprays recommended for application to the fruit only, as soon as the main flight of the first generation is ended are 2 lb. paris green, 10 to 20 lb. lead arsenate or calcium arsenate or 10 lb. nicotine, titrated at 15 percent, to 100 gal. bordeaux mixture. Treatments should be repeated at an interval of 8 to 10 days. In the case of the second generation the bordeaux-nicotine spray should be applied to the fruit only, 6 to 8 days after the main flight.

GLODEN-SCHENGEN, N. (1582)

1927. A NOTE ON THE CONTROL OF THE VINE-MOTHS WITH NICOTINE. Luxemburger Weinztg. 15 (5): 41-43. [In German. Abstract in Rev. Appl. Ent. (A) 15: 226. 1927.]

Nicotine sprays have proved excellent in Luxemburg against the second generation of the vine moths Clysia ambiguella Hb. and Polychrosis botrana Schiff. The minimum effective strength of pure nicotine is 1.5 per mille. The nicotine can be used with bordeaux mixture but is better in water containing 1/2 percent soft soap.

MIESTINGER, K. (1583)

1928. ON THE CONTROL OF VINE MOTHS BY THE COMBINATION OF PARIS GREEN AND TOBACCO EXTRACT. Allg. Weinztg. 1928 No. 10, 2 pp. [In German. Abstract in Rev. Appl. Ent. (A) 17: 209. 1929.]

The spray used in Austria and Germany with satisfactory results against the vine moths (Polychrosis botrana Schiff. and Clysia ambiguella Hb.) consists of bordeaux mixture containing 0.15 or 0.20 percent paris green, 0.75 or 1.00 percent quicklime and 2.5 percent tobacco extract.

CHAPPAZ, G. (1584)

1929. LA LUTTE CONTRE LA COCHYLIS ET L'EUDÉMIS EN 1928. Rev. Agr. France 1929 (6), pp. 55-59. [Abstract in Rev. Appl. Ent. (A) 17: 571. 1929.]

The substitution of lead arsenate for nicotine against the second generation of Clysia ambiguella Hb. and Polychrosis botrana Schiff. is recommended, since not only is it as effective and less expensive, but it has been found that nicotine is more likely to affect the quality of the wine.

MARSAIS, P. (1585)

1929. LATE TREATMENT OF GRAPES TO PROTECT THEM AGAINST MILDEW AND WORMS. Rev. Vitic. 71: 69-73. [In French. Abstract in Chem. Abs. 24: 2541. 1930.]

Wines made from grapes which had been treated throughout the 1929 season with nicotine, copper, and arsenic sprays were examined for quality (taste) and for the presence of nicotine. Nicotine was not found in sufficient quantity to be injurious to health, but there was sufficient to seriously affect the taste, especially with wines from grapes sprayed late in the season. Most of the nicotine was found in the lees. The nicotine content was appreciably greater than in either 1927 or 1928 wines from the same district.

FAES, H., STAEHELIN, M., and BOVEY, P. (1586)

1930. LA LUTTE CONTRE LES PARASITES DE LA VIGNE, INSECTES ET CHAMPIGNONS EN 1929. Ann. Agr. Suisse 31: 123-133. [Abstract in Rev. Appl. Ent. (A) 18: 604-605. 1930.]

One percent nicotine in bordeaux mixture, applied 7 days and again 14 days after the maximum flight of the moths gave better results than Volck oil (1 1/2 percent) against the eggs of the second generation of vine moths Clysia ambiguella Hb. and Polychrosis botrana Schiff.

MIESTINGER, K. (1587)

1930. MODERN EXPERIENCE ON THE CONTROL OF VINE MOTHS. Weinland, No. 5, p. 170 (reprint 2 pp.) [In German. Abstract in Rev. Appl. Ent. (A) 19: 157. 1931.]

Very good results have been obtained in Austria with a mixed spray containing paris green, bordeaux mixture, and 1.5 to 2 percent tobacco extract.

FAES, H., STAEHELIN, M., and BOVEY, P. (1588)

1933. LA LUTTE CONTRE LES ENNEMIS DE LA VIGNE EN 1932. Landw. Jahrb. Schweiz. 47(10): 1147-1159. [Abstract in Rev. Appl. Ent. (A) 22: 161. 1934.]

The percentage of the first brood of Clysia ambiguella killed by two applications of 1 percent bordeaux sprays containing 1.5 to 2 percent summer oil or 1 percent nicotine as an ovicide was 95 - 100, as compared with 79 - 87.5 by 1 percent sprays of lead or calcium arsenate.

CATONI, G. (1589)

1913. THE STRUGGLE AGAINST THE GRAPE CATERPILLAR (ARCTIA COJA L.). Bull. Off. Gouvt. Gén. Algérie 19 (11): 176-177. From Il Coltivatore. [In French. Abstract in Rev. Appl. Ent. (A) 1: 250-251. 1913.]

Grape vines in the south of France were sprayed with the following spray mixture: 2.5 lb. tobacco extract, 6.5 oz. soft potash soap, and 20 gal. water. The number of caterpillars was considerably reduced. The strength of the tobacco juice and of the soap should be standardized, but was not in these tests.

MARTINI, S. (1590)

1913. THE STRUGGLE AGAINST THE VINE TINEIDS. Riv. Vitic., Enol., ed Agr. [Conegliano] (5) 19 (8): 178-179. [In Italian. Abstract in Rev. Appl. Ent. (A) 1: 230-231. 1913.]

Grape vines in Italy infested with tineid moths were sprayed with bordeaux mixture combined with 2 percent phenicated tobacco extract; 1,140 bunches of grapes were sprayed and only 5.61 percent were attacked. "Estratto fenicato di tabacco" is a preparation of tobacco juice, to which a certain portion of phenol is added to prevent its use for other purposes, sold by the Italian Government to agriculturists.

ANONYMOUS (1591)

1917. PER COMBATTERE LE LARVE GRIGIE DELLA VITE. Riv. Agr. [Rome] 23 (44): 575.

In Italy it is recommended that grapes infested with cutworms be sprayed or watered with a mixture consisting of 2 kg. black soap, 1 l. kerosene, 1 l. nicotine, and 100 l. water. Dissolve the soap in 20 l. of water and add the other ingredients.

ANONYMOUS (1592)

1917. POUR COMBATTRE LES VERS GRIS DE LA VIGNE. Vie Agr. et Rurale 7 (32): 102. August 11. [Abstract in Rev. Appl. Ent. (A) 5: 452. 1917.]

For controlling the caterpillars of *Feltia exclamationis* spraying at night with the following is recommended: 10 lb. black soap dissolved in 10 gal. boiling water to which are added while stirring 1/2 gal. paraffin and then 1/2 gal. nicotine (100-percent) and lastly another 40 gal. water.

FEYTAUD, J. (1593)

1917. NOTE ON THE CATERPILLARS OF *FELTIA EXCLAMATIONIS*. Rev. Vitic. 46 (1190): 247-248. April 19. [In French. Abstract in Rev. Appl. Ent. (A) 5: 354. 1917.]

Artificial means of control include spraying with nicotine and arsenical solutions.

VOIGT, G. (1594)

1931. REMARKS ON THE GRAPE LEAF MINER, *ANTISPILA RIVILLEI* STT. Anz. Schädlingsk. 7 (8):90-93, illus. [In German. Abstract in Biol. Abs. 8 (7): 1679. Entry 16,570. 1933.]

The control of this insect in its pupal stage may be successfully effected by singeing the grape poles and fence posts with a torch and by spraying the young larvae before they enter the leaves with a 0.1 to 0.2 percent solution of nicotine sulphate.

WILLIAMS, L. L. (1595)

1931. THE GRAPE-BERRY MOTH PROBLEM DURING 1930. Peninsula Hort. Soc. [Del.] Trans. 1930, pp. 131-139. [Abstract in Rev. Appl. Ent. (A) 19: 270. 1931.]

The addition of 40-percent nicotine sulphate (1: 800) to the last application of a lead arsenate and fish-oil spray resulted in a greater efficiency than without the nicotine. Nicotine sulphate should be included in the 10-day spray, since it is effective against the grape-berry moth *Polychrosis viteana* Clem. and the grape leafhopper (*Erythroneura comes* Say.).

2. Codling Moth, 1897-1934

LAMBERT, D. (1596)

1897. LES MEILLEURES POIRES À CULTIVER. Lyon-Horticole 19: 115-118.

It is recommended in France that diluted tobacco juice should be repeatedly sprayed on apple trees during the blooming period to control Carpocapsa pomonella, the codling moth.

WELDON, G. P. (1597)

1909. REPORT OF FIELD ENTOMOLOGIST. Colo. Agr. Expt. Sta. 22d Ann. Rept. p. 31-35.

A block of apple trees (Ben Davis) were sprayed with various insecticides to control the codling moth. Black Leaf (1: 50) allowed 23 percent of wormy apples; sulphate of nicotine (10 oz. to 50 gal. water) allowed 30 percent wormy; and sulphate of nicotine (12 oz. to 50 gal.) 27 percent wormy. Unsprayed trees were 41 percent wormy, and lead arsenate (3 lb. to 100 gal.) allowed only 4 percent wormy. Nicotine preparations are of very little value, if any, in controlling the codling moth.

GILLETTE, C. P. (1598)

1910. NEW SPRAYS FOR THE CODLING MOTH. Jour. Econ. Ent. 3: 29-32.

Apple trees were sprayed with Black Leaf Extract (1: 50) and Sulfate of Nicotine (1 to 750). In regard to the first spray, 77 percent of the fruit was free from insect injury, and in regard to the second spray, 73 percent was free from injury. The check fruit was 58.9 percent free of injury.

CIMATTI, V. (1599)

1912. CONTRO LA TIGNUOLA DEL MELO. Riv. Agr. 18: 301.

Against the moth Carpocapsa pomonella on apple trees the following spray mixture is recommended in Italy: 2 kg. nicotine, 1 kg. sodium carbonate, 1 kg. denatured alcohol, and 100 l. water.

PARROTT, P. J. (1600)

1915. AN ANALYSIS OF SPRAYING METHODS AGAINST THE CODLING MOTH. Jour. Econ. Ent. 7: 164-170. [Abstract in Rev. Appl. Ent. (A) 3: 445. 1915.]

Lime-sulphur and lead and nicotine are the substances most largely used at present for spraying apple trees.

DeSELLEM, F. E. (1601)

1916. NICOTINE SULPHATE FOR CODLING MOTH CONTROL. Yakima Co., Wash., Hort. Dept. Ann. Rept., pp. 62-72.

The experiments conducted indicated that nicotine sulphate (1 to 800 of soap solution) acts as a material check to the work of the codling moth. When it and lead arsenate were used side by side, the former was as efficient as the latter in codling moth control and kept the trees from all sucking insects. Nicotine also acted as a material check to the spread of the San Jose scale.

——— (1602)

1916. NICOTINE SULPHATE AND ARSENATE OF LEAD EXPERIMENTS FOR CONTROLLING MOTH. Wash. State Hort. Assoc. Proc. 12th Ann. Meeting 1915, pp.91-97.

From the data presented nicotine has either acted as a repellent to the codling moth or the larvae refused to eat. The foliage of the trees sprayed with nicotine were a deeper green than is usual and were free from aphids and red spiders. Nicotine also eradicated nearly all the San Jose scale from tree D. From an economical standpoint it would be impracticable to use nicotine sulphate at the present prices, instead of lead arsenate, in controlling the codling moth. But, if the prices were reduced, the growers could then use it in controlling this insect and also to check the scale during the growing season.

——— (1603)

1917. NICOTINE SULPHATE IN CODLING MOTH CONTROL. Wash. State Hort. Assoc Proc. 13th Ann. Meeting 1917, pp. 111-121.

The work during 1915 and 1916 indicates that nicotine sulphate acts as a material check to the work of the codling moth and to the spread of the San Jose scale. At the present prices of nicotine it would not be advisable to substitute nicotine sulphate for lead arsenate in controlling the codling moth alone, but where aphids and sucking insects are to be controlled the omission of lead arsenate will result in considerable saving. When nicotine sulphate and lead arsenate were used side by side, the former proved as efficient as the latter in controlling the codling moth and kept the trees free from all sucking insects. It was not necessary to use nicotine stronger than 1 to 800 for the codling moth and 1 to 1,024 gave nearly as good results. Soap should be used with it.

EATON, J. S., and WATERBURY, H. E. (1604)

1917. CODLING MOTH EXPERIMENTAL WORK IN ROSS ORCHARD. Yakima Co., Wash., Dist. Hort. Insp. Ann. Rept. pp. 27-42.

The results of DeSellem (1916) are reviewed. Their own results on nicotine sulphate do not corroborate those of DeSellem (pp. 29-30, 35, 36). Their conclusions are not favorable to nicotine sulphate as a codling moth control where infestation is heavy.

LOVETT, A. L. (1605)

1917. NICOTINE SULPHATE AS A POISON FOR INSECTS. Jour. Econ. Ent. 10: 333-337. [Abstract in Chem. Abs. 11: 3369. 1917.]

Nicotine sulphate at from 1 to 400 to 1 to 1,200 on foliage was strongly repellent to tent caterpillars (Malacosoma pluvialis) and those which ate the foliage were killed quickly. A field test with nicotine sulphate 1 to 400 as a spray against the codling moth on apple showed in one instance a 50-percent reduction in the amount of injured fruit.

FROMME, F. D., and SCHOENE, W. J. (1606)

1918. DUSTING AND SPRAYING FOR APPLE SCAB AND CODLING MOTH. Va. State Ent. and Plant Path. 11th Rept. 1916-1917, pp. 22-26, illus. [Abstract in Rev. Appl. Ent. (A) 7: 207. 1919.]

Spraying with lime-sulphur and nicotine sulphate gave less satisfactory results against codling moth than a lime-sulphur and lead arsenate spray.

HOWARD, L. O. (1607)

1918. REPORT OF THE ENTOMOLOGIST. U. S. Dept. Agr. Bur. Ent., 24 pp. 1918. [Abstract in Rev. Appl. Ent. (A) 7: 100-104. 1919.]

Tests on the ovicidal action of nicotine have shown that it is not sufficient to control Cydia pomonella satisfactorily when used alone.

LOVETT, A. L. (1608)

1918. NICOTINE SULPHATE AN EFFECTIVE OVICIDE FOR CODLING MOTH EGGS. Jour. Econ. Ent. 11: 149-150. [Abstract in Rev. Appl. Ent. (A) 6: 208. 1918.].

Black Leaf 40 (1: 1,200) plus fish oil soap 4 lb. to 100 gal. killed 100 percent of the eggs of the codling moth.

WATERBURY, H. E. (1609)

1918. EXPERIMENTAL ENTOMOLOGICAL WORK. Yakima Co., Wash., Dist. Hort. Insp. Ann. Rept. 1917, pp. 25-54, illus.; Wash. Dept. Agr. Bien. Rept. 3 (1917-18): 78-87. [Abstract in Expt. Sta. Rec. 41: 160. 1919.]

The results obtained from the use of nicotine sulphate during the year failed to confirm the earlier results (Expt. Sta. Rec. 38: 653), and led to the conclusion that nicotine under lower valley conditions is not so effective against codling moth as is lead arsenate. In one experimental plat the nicotine was as effective as the lead but no more effective.

HOWARD, L. O. (1610)

1920. REPORT OF THE ENTOMOLOGIST. U. S. Dept. Agr. Bur. Ent. Ann. Rept. 1920, 36 pp. [Abstract in Rev. Appl. Ent. (A) 9: 110-114. 1921.]

Tests against Cydia pomonella are being made with a dust composed of a fungicide, lead arsenate, and tobacco extract. Against the potato leafhopper, Empoasca mali, bordeaux mixture proved a satisfactory repellent while nicotine sulphate and kerosene emulsion were ineffective.

LOVETT, A. L. (1611)

1920. INSECTICIDE INVESTIGATIONS. Ore. Agr. Expt. Sta. Bull. 169, 55 p illus. [Abstract in Rev. Appl. Ent. (A) 8: 372. 1920.]

Nicotine sulphate is a powerful repellent for tent caterpillars, and if feeding does take place even weak solutions kill almost instantly It is an effective ovicide for codling moth, especially with the addition of soap, but is not to be recommended as a substitute for the stand ard arsenate sprays in codling moth control.

FEYTAUD, J. (1612)

1921. ESSAIS DE BUILLIES MIXTES POUR LE TRAITEMENT DES ARBRES FRUITIERS Ann. Epiphyties 7: 195-236, illus.

The following is one of the spray mixtures recommended against the larvae of the codling moth (Carpocapsa pomonella L.) on apple and pear trees: 15 parts titrated nicotine extract, 6.6 parts copper sulphate, 30 parts slaked lime, and 1,000 parts water (p. 199). A few eggs of the codling moth, which were treated with the above bordeaux-nicotine mixture, were all aborted (pp. 231-232).

McINDOO, N. E., SIMANTON, F. L., PLANK, H. K., and FISKE, R. J. (1613)

1921. EFFECTS OF NICOTINE SULPHATE AS AN OVICIDE AND LARVICIDE ON THE CODLING MOTH AND THREE OTHER INSECTS. U. S. Dept. Agr. Bull. 938, 19 [Abstract in Rev. Appl. Ent. (A) 9: 576. 1921.]

Nicotine sulphate (40-percent) is effective in destroying the fresh eggs of Bombyx mori, L.; in older eggs hatching is more or less retarded by it. The exhalation from leaves dipped in the solution 1 to 5 days previously proved fatal to newly hatched larvae, and when fed on the leaves 6 to 11 days after dipping, they also succumbed.

Against eggs of the codling moth (Cydia pomonella) nicotine sulphate did not prove effective, only about 20 percent of the eggs failing to hatch. Larvae placed on pears that had been sprayed 1 or 2 days previously were reduced by about 75 percent, the mortality decreasing to about 25 percent on the sixth and seventh days. Similar experiments carried out with eggs of Leptinotarsa decemlineata, L. (potato beetle) and Hemerocampa leucostigma S. & A. (tussock moth) proved the inefficiency of nicotine sulphate as an ovicide in the case of these species.

By chemical and histological methods it was shown that nicotine-sulphate spray solutions, containing soap, do not pass into the leaves sprayed, nor does the dust in the film of adhering nicotine sulphate enter the stomata of the leaves (p. 14 of original).

Field experiments show that nicotine sulphate (1:800) with soap, is fairly efficacious against the larvae of Cydia pomonella, but it is inferior in action to a spray of 1 lb. powdered lead arsenate to 50 gal. water. There is apparently no advantage in combining nicotine sulphate and lead arsenate against this pest.

STEARNS, L. A., and HOUGH, W. S. (1614)

1923. SPREADER TESTS ON APPLES AND PEACHES. Jour. Econ. Ent. 16: 198-201. [Abstract in Rev. Appl. Ent. (A) 11: 334. 1923.]

Nicotine sulphate (40-percent) and a casein spreader were found to be incompatible.

KLEIN, J. (1615)

1925. CONTROLLING CODLING MOTH IN WALNUTS. Calif. Cult. 64 (21): 583,587, illus. [Abstract in Rev. Appl. Ent. (A) 14: 248. 1926.]

Dusting and spraying have been used for the control of codling moth in walnuts with almost identical results. The spray consisted of 16 lb. lead arsenate, 1 pt. nicotine sulphate and 4 lb. spreader in 400 gal. of water. It was pumped under 400 lb. pressure and an average of 27 gal. was used per tree. The damage in the sprayed areas ranged from 4.2 to 7.1 percent as compared with 12 to 22.2 percent in unsprayed ones.

GURNEY, W. B., and BRERETON, W. LeG. (1616)

1926. THE CONTROL OF WOOLLY APHIS, METHODS THAT ARE AVAILABLE. Agr. Gaz. N. S. Wales 37 (7): 545-551. [Abstract in Rev. Appl. Ent. (A) 14: 550-551. 1926.]

One grower reports great success in the last two years in controlling the woolly apple aphid (Eriosoma lanigerum Hausm.) with an autumn spray of 2 lb. caustic soda, 3/4 pt. nicotine sulphate (40-percent) and 100 gal. water. When early fungicide treatments are necessary very good results have been obtained by combining winter strength lime-sulphur and tobacco wash or commercial nicotine extract applied when the buds were swelling. In Victoria a combination of 1 gal. oil and 1 pt. 40-percent nicotine sulphate to 80 gal. water gave great success as a winter spray against E. lanigerum. Tobacco wash prepared without soda and many of the commercial extracts may be safely combined with lead arsenate and can be used against both the woolly aphid and the codling moth (Cydia pomonella L.) Nicotine sulphate (40-percent) is generally diluted to 1 pt. to 100 gal. of water for E. lanigerum. The addition of miscible oil, using 2, 3, or 5 pt. to 100 gal. tobacco spray, increases its efficiency.

BOURNE, A. I., and WHITCOMB, W. D. (1617)

1927. THE CODLING MOTH IN MASSACHUSETTS. Mass. Agr. Expt. Sta. Bull. 233, pp. 55-72. [Abstract in Rev. Appl. Ent. (A) 16: 361. 1928.]

The addition of nicotine sulphate to lead arsenate sprays against the eggs of C. pomonella appears to be uneconomical unless it serves to control other pests as well.

FOWLER, R. (1618)

1927. FURTHER INVESTIGATIONS INTO CODLING MOTH CONTROL. SECOND REPORT ON EXPERIMENTS CARRIED OUT AT BLACKWOOD EXPERIMENT ORCHARD. Jour. Dept. Agr. So. Aust. 31 (5): 480-492. [Abstract in Rev. Appl. Ent. (A) 16: 285-286. 1928.]

The spray that gave the best results consisted of 2 lb. lead arsenate to 50 gal. water. The addition of lime-sulphur or 40-percent nicotine sulphate did not improve the efficacy of the sprays to any appreciable extent.

HOWARD, L. O. (1619)

1927. REPORT OF THE ENTOMOLOGIST. U. S. Dept. Agr. Bur. Ent. Ann. Rept. 29 pp. [Abstract in Rev. Appl. Ent. (A) 17: 272-275. 1929.]

Nicotine sulphate (1:800) used in three cover sprays following a calyx and first cover spray of lead arsenate, gave very satisfactory results against the codling moth.

ANONYMOUS (1620)

1928. REPORT OF THE DIVISION OF ENTOMOLOGY OF THE WASHINGTON STATION. Wash. Col. Agr. Expt. Sta. Bull. 229, pp. 27-29. [Abstract in Expt. Sta. Rec. 60: 842-843. 1929.]

Excellent results were obtained with 2 percent nicotine dusts, but the high cost of some of these treatments prevents their use except for checking the influx of potato flea beetles at the edges of potato fields early in the season.

In the 1927 experiments with the codling moth, it was found that nicotine sulphate (1:600) could be used as a substitute for lead arsenat in the second and third cover sprays, although this combination was somewhat less effective. The indications are to the effect that some combination of nicotine sulphate may be of value in reducing arsenical residue and still serve to keep the codling moth well in check.

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1928. INSECT PESTS IN IDAHO IN 1927. Idaho Agr. Expt. Sta. Bull. 160, pp. 21-23. [Abstract in Rev. Appl. Ent. (A) 17: 316. 1929.]

Nicotine in combination with soap was much less effective than in combination with 1/2 percent oil emulsion in controlling the codling moth (Cydia pomonella L.).

HARTZELL, A., and WILCOXON, F. (1622)

1928. ANALYSES OF SPRAYED APPLES FOR LEAD AND ARSENIC. Jour. Econ. Ent. 21: 125-130. [Abstract in Rev. Appl. Ent. (A) 16: 394-395. 1928.]

Treatment with a spray containing 4 lb. lead arsenate powder, 2 lb. casein-lime, and 1 1/2 pt. nicotine sulphate to 150 gal. gave 96 percent control of the codling moth. Five applications were made, two before and two after the calyx spray. Lime-sulphur was combined with the first four sprays.

HEADLEE, T. J. (1623)

1928. AN OPERATION IN PRACTICAL CONTROL OF CODLING MOTH IN A HEAVILY INFESTED DISTRICT-SECOND REPORT. Jour. Econ. Ent. 21: 774-778. [Abstract in Chem. Abs. 23: 467. 1929.]

A report on procedure which resulted in 82 percent of the apples picked being free from codling moth (Carpocapsa pomonella) injury. The timing, composition, and method of applying insecticides, including nicotine, were the most important factors in producing this result.

LEVICK, G. T. (1624)

1928. CODLING MOTH CONTROL. Jour. Dept. Agr. Victoria 26 (8): 459-462.

Nicotine sulphate was used in combination with lead arsenate, but it did not appear to have any effect in reducing the codling moth infestation.

MARLATT, C. L. (1625)

1928. REPORT OF THE ENTOMOLOGIST. U. S. Dept. Agr. Bur. Ent. 34 pp. [Abstract in Rev. Appl. Ent. (A) 17: 272-275. 1929.]

Nicotine sulphate (1:800) used in three cover sprays, following a calyx and first cover spray of lead arsenate, gave very satisfactory results against the codling moth.

MOTE, D. C. (1626)

1928. DEPARTMENT OF ENTOMOLOGY. Oreg. Agr. Expt. Sta. Bien. Rept. 1926-28, pp. 101-109. [Abstract in Rev. Appl. Ent. (A) 18: 78. 1930.]

Nicotine sulphate substituted for lead arsenate in the last cover spray for the control of the codling moth (Cydia pomonella L.) gave slightly inferior results.

DeSELLEM, F. E. (1627)

1929. RECENT DEVELOPMENT IN CONTROLLING CODLING MOTH WITH NICOTINE-OIL. Wash. State Hort. Assoc. Proc. 25, pp. 95-107, illus.

The nicotine-oil combination has proved more efficient than lead arsenate alone the past two seasons in controlling the second brood and simplifies the residue removal. It is a well-known fact that if too many lead-oil sprays are applied the removal of the spray residue is a serious question.

The nicotine-oil combination if properly spaced in the codling moth program along with lead arsenate and lead-oil will control the codling moth larvae, orchard mites, aphids, leafhoppers, and summer crawlers of San Jose scale and will also simplify residue removal.

FLINT, W. P. (1628)

1929. ORCHARD INSECT CONTROL FOR 1928. Ill. Hort. Soc. Trans. 1928, 62: 97-109. [Abstract in Rev. Appl. Ent. (A) 17: 387-388. 1929.]

Experiments were carried out with oil sprays for the control of second and third brood larvae of the codling moth (Cydia pomonella L.) Two sprays with a 2 percent white oil emulsion reduced the infestation to 1.1 percent and 0.7 percent respectively. The same oil at 1 percent with nicotine sulphate (1:800) allowed an infestation of 0.3 percent.

HERBERT, F. B., and LEONARD, M. D. (1629)

1929. OBSERVATIONS ON THE OIL-NICOTINE COMBINATION FOR THE CONTROL OF THE CODLING MOTH AND OTHER APPLE INSECTS IN THE PACIFIC NORTHWEST. Jour. Econ. Ent. 22: 72-78. [Abstract in Rev. Appl. Ent. (A) 17: 369-370. 1929.]

A combination of oil and nicotine gives better results than those obtained with lead arsenate with or without oil in the control of Cydia (Carpocapsa) pomonella L. and the other more important pests of apple. Oil with nicotine usually gave commercial control of mites, San Jose scale (Aspidiotus perniciosus Comst.), and the green aphid (Aphis pomi DeG.), and considerably reduced the numbers of woolly apple aphid (Eriosoma lanigerum Hausm.).

LEVICK, G. T. (1630)

1929. CONTROL OF THE CODLING MOTH (CYDIA POMONELLA LINN.) Jour. Dept. Agr. Victoria 27 (9): 533-542. [Abstract in Rev. Appl. Ent. (A) 18: 107. 1930.]

The addition of nicotine sulphate and lime-sulphur to lead arsenate did not increase its efficiency in controlling the codling moth. With lead arsenate sprays alone, codling moth infestations amounted to 22, 13, and 58 percent respectively in 1926-7, 1927-8, and 1928-9.

McALISTER, I. C., JR. (1631)

1929. PRELIMINARY REPORT ON CONTROL OF HIBERNATING CODLING MOTH LARVAE. Jour. Econ. Ent. 22: 424-425. [Abstract in Chem. Abs. 23: 3534. 1929.

Nicotine was less efficient than undiluted kerosene and ethylene dichloride in killing the hibernating larvae of the codling moth (Carpocapsa pomonella).

NEWCOMER, E. J. (1632)

1929. THE CODLING MOTH IN THE PACIFIC NORTHWEST: STATUS OF PRESENT SPRAY PRACTICES AND PROSPECTS FOR IMPROVEMENTS IN CONTROL MEASURES. 4th Internatl. Cong. Ent. 1928. 2 (Trans.) pp. 567-570. [Abstract in Rev. Appl. Ent. (A) 18: 313-314. 1930.]

In the future the later sprays for codling moth control will consist of oil, nicotine, or some other material that will reduce the residue hazard and the losses from stings.

PETTEY, F. W. (1633)

1929. CODLING MOTH CONTROL. EXPERIMENTS WITH SUMMER OIL SPRAYS. Farming in So. Africa reprint No. 56, 13 pp. [Abstract in Rev. Appl. Ent. (A) 18: 102-103. 1930.]

No radical changes in the present methods of control can be adopted; the indications are that a program may ultimately be adopted allowing the reduction of lead arsenate sprays to 2 or 3 applications to be followed by 3 or more combination oil-nicotine, oil-pyrethrum or oil-derris sprays and so obviating the necessity of removing arsenical residue.

SMITH, R. H. (1634)

1929. ADDITIONAL INFORMATION ON CONTROLLING CODLING MOTH BY SPRAYING AND DUSTING. Diamond Walnut News 9 (1): 8-9. [Abstract in Rev. Appl. Ent. (A) 17: 386-387. 1929.]

Tests were carried out with a number of insecticides against newly hatched codling moth larvae, and it was found that 3/4 pt. of nicotine sulphate with 1 lb. caseinate spreader in 100 gal. water was the most satisfactory, giving a mortality of 42.3 percent.

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1929. BEHAVIOR OF THE NEWLY-HATCHED CODLING MOTH WORM ON WALNUTS. Calif. Cult. 72 (22): 634-635. [Abstract in Biol. Abs. 4 (7-9): 2094. Entry 22,207. 1930.]

Nicotine spray and dust killed a large percentage of Carpocapsa pomonella on English walnuts.

SPULER, A. (1636)

1929. MORE EFFICIENT CODLING MOTH CONTROL. Idaho Hort. Assoc. Proc. 34th Ann. Meeting, pp. 100-111. [Abstract in Rev. Appl. Ent. (A) 17: 710-712. 1929.]

Nicotine sulphate used alone was not effective, but a combination of nicotine sulphate and oil proved as effective as lead arsenate or more so. Owing to the high cost of this material and possible injury to fruit and trees, this combination is not recommended for more than 2 or 3 treatments, which should be made when most of the eggs of the first and second broods are being laid.

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1929. SPRAYING EXPERIMENTS FOR CODLING MOTH CONTROL. Wash. Dept. Agr. Expt. Sta. Bull. 232, 70pp., illus. [Abstract in Rev. Appl. Ent. (A) 18: 273-275. 1930.]

Nicotine sulphate acts as an ovicide and larvicide, but soon loses its insecticidal value and cannot be used alone unless applied at frequent intervals. The addition of 1 lb. aluminum sulphate to 100 gal. nicotine sulphate (1:800) prolonged its insecticidal value, but produced russeting or blotching. Nicotine oleate was not so effective as nicotine sulphate. A combination of oil and nicotine proved equal to or better than the standard lead arsenate spray in four tests. This spray, which is also effective against mites, leafhoppers, and aphids, may therefore be used as a substitute for some of the lead arsenate sprays.

WAKELAND, C. (1638)

1929. SOME RESULTS FROM OIL EMULSION SPRAYS FOR CODLING MOTH CONTROL IN 1927 AND 1928. Idaho Hort. Assoc. Proc. 34th Ann. Meeting, pp. 64-77. [Abstract in Rev. Appl. Ent. (A) 17: 710. 1929.]

Certain combinations of oil and lead arsenate or of oil, nicotine sulphate, and lead arsenate were more effective in controlling the codling moth than lead arsenate alone, but were more expensive. Oil or oil and nicotine also reduce infestation by certain other insects and may sometimes be added with advantage to one or more of the codling moth treatments on this account.

WRIGHT, W. H. (1639)

1929. THE DOLLAR SIGN IN WALNUT PEST CONTROL. Calif. Dept. Agr. Monthly Bull. 18 (4): 278-282, illus. [Abstract in Rev. Appl. Ent. (A) 17: 519. 1929.]

In regard to the codling moth and aphids on walnuts, both pests may be controlled by a spray of 15 lb. basic lead arsenate, 1 pt. 40-percent nicotine sulphate, 3 lb. spreader to 300 gal. water, If aphids occur alone, nicotine dust may be used.

ALLMAN, S. L. (1640)

1930. CODLING MOTH EXPERIMENTS, 1929-30. SUMMARY OF RESULTS OBTAINED A BATHURST EXPERIMENT FARM. Agr. Gaz. N. S. Wales 41 (11): 834-844. [Abstract in Rev. Appl. Ent. (A) 19: 194-195. 1931.]

White oil (1:80) with nicotine sulphate (1:800) gave fair results, being mainly ovicidal in its action, but caused a certain amount of injury to the fruit.

ANONYMOUS (1641)

1930. ENTOMOLOGY. Ohio Agr. Expt. Sta. Ann. Rept. 48 (1928-1929) Bull. 446, pp. 78-93, illus. [Abstract in Rev. Appl. Ent. (A) 18: 550-552. 1930.]

The addition of nicotine to lead arsenate and oil sprays greatly increased the mortality of codling moth larvae during the first 48 hours after spraying, but from that time onward little difference in infestation was noted. Apple trees sprayed with lime-sulphur at dormant strengths with the addition of nicotine sulphate (1:800 or 1:1000) were almost entirely free from aphids (*Anuraphis roseus* Bak.). The most effective spray against *Aphis pomi* DeG. is nicotine sulphate 3/4 pt. to 100 gal. water, to which is added 3/4 gal. commercial miscible oil or 1 gal. oil emulsion.

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1930. DEPARTMENT OF ENTOMOLOGY. Ore. Agr. Expt. Sta. Bien. Rept. 1928-1930, pp. 86-90. [Abstract in Rev. Appl. Ent. (A) 19: 201-202. 1931.]

In tests with substitutes for lead arsenate against the codling moth carried out under field conditions in Oregon, calcium arsenate gave as good control as lead arsenate. Of the other materials, pyrethrum gave the best results, and those secured with nicotine sulphate, and sodium and barium fluosilicates warrant further tests.

GROSS, C. R., and FAHEY, J. E. (1643)

1930. SOME OF THE CHEMICAL PROBLEMS IN CODLING MOTH CONTROL. Northwest Fruit Grower, May - June, pp. 7, 22. [Abstract in Rev. Appl. Ent. (A) 18: 646-647. 1930.]

A nicotine and oil combination held the nicotine better than any other combination tried; other combinations - nicotine tannate plus fish oil, and nicotine sulphate plus corn syrup and glycerine were, however, better than nicotine sulphate applied alone. Nicotine oleate gave poor control and scorched the foliage. The degree of control was found to be correlated in general with the amount of nicotine remaining on the foliage.

HEADLEE, T. J. (1644)

1930. SOME SUBSTITUTES FOR ARSENIC IN CODLING MOTH CONTROL. Amer. Fruit Grower Mag., p. 25, Feb. [Abstract in Biol. Abs. 5 (3): 854, Entry 8,520. 1931.]

A spray, which controlled *Carpocapsa pomonella* as well as arsenical sprays without leaving a harmful residue on the fruit, was nicotine tannate made from 3 lb. commercial tannic acid, 1 lb. 50-percent free nicotine, and 100 gal. water.

HEADLEE, T. J., GINSBURG, J. M., and FILMER, R. S. (1645)

1930. SOME SUBSTITUTES FOR ARSENIC IN CONTROL OF CODLING MOTH. Jour. Econ. Ent. 23: 45-53. [Abstract in Rev. Appl. Ent. (A) 18: 386-387. 1930.]

Nicotine tannate (3 lb. tannic acid to 1 pt. 50-percent nicotine sulphate) gave 73.2 percent fruit free from codling moth injury as compared with 57.5 percent from standard arsenical-treated rows. Trees treated with nicotine tannate were as well protected against the Japanese beetle as those treated with standard arsenical sprays and were very largely protected against injury from late broods of leafhoppers.

KELSALL, A., HOCKEY, J. F., and WALKER, G. P. (1646)

1930. EXPERIMENTS WITH NEW SPRAY MIXTURES. Pomol. Fruit Growers'. Soc. 36th Ann. Rept., Quebec 1929, pp. 26-37. [Abstract in Rev. Appl. Ent. (A) 19: 473-474. 1931.]

With regard to sprays for apples, in pre-blossom applications as much as 1.5 lb. calcium arsenate, but after blossoming not more than 0.75 lb. can be used, and in the last application 0.5 lb. nicotine sulphate may be added. The addition of iron sulphate to lime-sulphur eliminates injury; used alone or with nicotine this mixture is a poor fungicide. Preliminary tests with calcium monosulphide indicate that this is an effective and safe fungicide for use on apple trees that can be combined with lead arsenate, calcium arsenate, or nicotine sulphate.

LEONARD, M. D. (1647)

1930. FURTHER EXPERIMENTS WITH NICOTINE-OIL FOR THE CONTROL OF THE CODLING MOTH IN THE PACIFIC NORTHWEST. Jour. Econ. Ent. 23: 61-75. [Abstract in Rev. Appl. Ent. (A) 18: 387-388. 1930.]

Commercial scale tests are reported. In most cases 1/2 pt. of 40-percent nicotine sulphate to 100 gal. was employed. A consideration of the comparative results indicated that nicotine-oil combinations undoubtedly give better results when used only in the last 2 or 3 cover sprays than when used in all the cover sprays or in the early ones only. In most cases it is best to start the season with 1 or 2 applications of lead arsenate (2 lb. to 100 gal.) followed by 2 of lead arsenate-oil, completing the schedule with 2 or possibly 3 applications of nicotine-oil. This program appears to be the most efficient in controlling the major pests of apples and also the most economical from the point of view of net returns to the grower.

NEWCOMER, E. J., and SPULER, A. (1648)

1930. SUGGESTIONS FOR USE OF OIL SPRAYS IN 1930. Jour. Econ. Ent. 23: 289-290. [Abstract in Chem. Abs. 24: 3311. 1930.]

Petroleum oil should be used in sprays containing nicotine sulphate to control the codling moth (Carpocapsa pomonella). The oil-nicotine sulphate spray is recommended for use after July 25.

PETTEY, F. W. (1649)

1930. NEW METHODS FOR THE CONTROL OF CODLING MOTH. EXPERIMENTS CARRIED OUT DURING 1930. So. Africa Dept. Agr. Bull. 90, 10pp., illus. [Abstract in Rev. Appl. Ent. (A) 19: 59-60. 1931.]

The addition of nicotine sulphate (1:1,200) to any of the oil-arsenate cover sprays will control the wooly aphid (Eriosoma lanigerum Hausm.) if the sprays are thoroughly applied. When desirable for controlling other pests on pears or apples, 1 percent medium oil and nicotine sulphate 1 to 800 or 1 to 1,200 may be used with advantage as a substitute for one or two of the lead arsenate sprays; more than two applications are not recommended on account of expense.

REGAN, W. S. (1650)

1930. RESULTS OF INSECTICIDE TESTS FOR THE CONTROL OF CODLING MOTH AND OBSERVATIONS ON CODLING MOTH ACTIVITY DURING THE SEASON OF 1929 IN THE YAKIMA VALLEY, WASHINGTON. 16 pp. Calif. Spray Chemical Co., Berkeley, Calif. [Abstract in Biol. Abs. 5 (10): 2391. Entry 24,221. 1931.]

Orchard experiments showed greatly improved control of codling moth (Carpocapsa pomonella) under Northwest conditions by the combination of arsenate of lead with summer oil. The possibility of good results with reduction of the arsenical dosage in this combination is shown, as well as the substitution of a combination of nicotine sulphate and oil for lead arsenate.

ROBINSON, R. H., FISHER, D. F., and SPULER, A. (1651)

1930. THE WESTERN COOPERATIVE OIL SPRAY PROJECT (1929). Science 71 (1843): 440-441.

The use of oil sprays late in the summer was found to complicate seriously the problem of spray-residue removal. Where not more than two applications of oil spray are made in combination with lead arsenate for the first brood of codling moth or where the nicotine-oil combination without lead arsenate is used for the second brood, the arsenical residue problem has not been seriously complicated.

SPULER, A., and DEAN, F. P. (1652)

1930. NEW COMBINATION SPRAYS FOR CODLING MOTH CONTROL. Jour. Econ. Ent. 23: 53-61, illus. [Abstract in Rev. Appl. Ent. (A) 18: 387. 1930.]

Nicotine-oil combinations have proved as effective as lead arsenate when applied as cover sprays for the first brood, and decidedly more effective if applied in second brood sprays. The combination of oil, 1 to 100, and nicotine sulphate (1/2 pt. to 100 gal.) has given a control of the codling moth equal to that of lead arsenate, 1 lb. to 50 gal. In view of the removal of residues, combinations of mineral oil or fish oil with lead arsenate should be applied in first-brood sprays and mineral oil-nicotine sulphate combinations in second-brood sprays.

ALLMAN, S. L. (1653)

1931. CODLING MOTH EXPERIMENTS, 1930-31. RESULTS OBTAINED AT BATHURST EXPERIMENT FARM. Agr. Gaz. N. S. Wales 42 (10 and 12): 810-816, 955-961, illus. [Abstract in Rev. Appl. Ent. (A) 20: 166. 1932.]

Lead arsenate formed the common basis of the most satisfactory spray mixtures; of the non-arsenicals tried, a combination of white oil and nicotine sulphate proved the best. A mixture of nicotine sulphate and tannic acid (nicotine tannate) gave little control.

FARRAR, M. D. (1654)

1931. THE USE OF OILS IN THE APPLE SPRAY PROGRAM. Tenn. State Hort. Soc. Proc. Ann. Conv. 26: 84-89. [Abstract in Biol. Abs. 7 (5): 1163. Entry 11,457, 1933.]

White oils combined with nicotine sulphate give increased insecticidal efficiency against the codling moth.

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1931. EFFECT OF OIL SPRAYS ON ORCHARD FRUIT AND FOLIAGE. Ind. Hort. Soc. Trans. 1930, pp. 76-80. [Abstract in Biol. Abs. 6 (5): 1429. Entry, 13,925. 1932.]

Nicotine sulphate (1:800) combined with oil emulsion gave control comparable to lead arsenate.

NEWCOMER, E. J., YOTHERS, M. A., and WHITCOMB, W. D. (1656)

1931. CONTROL OF THE CODLING MOTH IN THE PACIFIC NORTHWEST. U. S. Dept. Agr. Farmers' Bull. 1326, revised, 26 pp., illus. [Abstract in Rev. Appl. Ent. (A) 19: 628. 1931.]

This is a revision of previous bulletins (Rev. Appl. Ent. (A) 12: 247; 18: 384), the principal additional information dealing with the use of oil emulsions combined with lead arsenate sprays against the first brood or with nicotine sulphate against the second brood.

PETTEY, F. W. (1657)

1931. THE CODLING MOTH AND EXPERIMENTS FOR ITS CONTROL IN APPLE ORCHARDS OF THE HIGH VELDT DURING 1930-31. Union So. Africa Dept. Agr. Sci. Bull. 104, 30 pp., illus. [Abstract in Rev. Appl. Ent. (A) 20: 267-268. 1932.]

The addition of 1 percent medium or light grade summer oil with 40-percent nicotine sulphate (1:1200) and calcium caseinate to the 3d, 5th, and 7th sprays in the standard lead arsenate spray program gave satisfactory control of severe infestations of the woolly aphids (Eriosoma lanigerum Hausm.). Similar sprays containing more nicotine sulphate (1:800), calcium caseinate, and no oil gave equally good results and improved the control against the codling moth. A program of double strength lead arsenate with a spreader, in which nicotine sulphate (1:800) was added in the 3d spray to control the woolly aphid, gave almost as good results against the codling moth as the standard one with 1 percent medium grade oil and spreader added to the 3d, 5th, and 7th sprays, and nicotine sulphate (1:1,200) added to the 3d and 5th.

QUAINTANCE, A. L., et al. (1658)

1931. REPORT OF COMMITTEE TO FORMULATE PLANS FOR INVESTIGATIONS OF THE CODLING MOTH FROM BIOLOGIC AND CONTROL STANDPOINTS. Jour. Econ. Ent. 24 (1): 18-23.

Reports on oil-nicotine by Spuler, Sherman, Newcomer, Haseman, Ackerman, Gilmer, Flint, Davis, and Thompson are given. Some of these investigators say that the oil-nicotine combination gave results equal to those obtained with lead arsenate, while others did not get such good results (p.20). Favorable reports on nicotine tannate by Headlee, Spuler, Newcomer, Stearns, and Lothrop and Sazama are also given (p. 21).

REGAN, W. S. (1659)

1931. RESULTS OF INSECTICIDE TESTS FOR THE CONTROL OF CODLING MOTH AND OBSERVATIONS ON CODLING MOTH ACTIVITY DURING THE SEASON OF 1930 IN THE YAKIMA VALLEY, WASH. 22pp. Berkeley, Calif. [Abstract in Rev. Appl. Ent. (A) 19: 632. 1931.]

Nicotine sulphate (40-percent) with the oil instead of lead arsenate in late sprays gave sufficiently good control to indicate the possibility of using this material where residue removal is a serious problem.

SHERMAN, F. (1660)

1931. RECENT EXPERIMENTAL WORK ON CODLING MOTH. Mich. State Hort. Soc. Ann. Rept. 60: 48-50. [Abstract in Biol. Abs. 6 (5): 1423, Entry 13,859, 1932.]

One application of oil and nicotine on strawberry apples for summer brood larvae gave better control than a single application of lead arsenate. Apples treated with lead arsenate had an excessive arsenical residue, while those treated with oil and nicotine showed less than the world's tolerance. Oil-nicotine is not effective on late varieties when applied as a substitute for lead arsenate at the times indicated in the spray calendar for spraying with lead arsenate. Sunoco oil used at rate of 1 gal. with 3/4 pt. nicotine sulphate to 100 gal. of water is unsafe on apples.

SHERMAN, F. III (1661)

1931. SPRAYING TO CONTROL THE CODLING MOTH IN SOUTHWESTERN MICHIGAN. Jour. Econ. Ent. 24 (5): 1075-1077. [Abstract in Rev. Appl. Ent. (A) 20: 34. 1932.]

Sprays of oil with nicotine sulphate gave good results on an early variety, but were less satisfactory on later varieties. In all cases where oil with nicotine was employed in the summer brood sprays, the arsenical residue on the fruit was greatly reduced. Oil sprays, where applied alone for the summer brood larvae, were ineffective. One proprietary oil when used in combination with nicotine sulphate caused injury to the fruit.

SPULER, A., et al. (1662)

1931. VALUE OF COMBINATIONS WITH LEAD ARSENATE, AND SUMMER OILS IN CODLING MOTH CONTROL. Wash. State Hort. Assoc. Proc. 26 (1930), pp. 59-72, illus. [Abstract in Rev. Appl. Ent. (A) 20: 19-20. 1932.]

A series of spray programs was tested. The best results were obtained from the following materials per 100 gallons: A calyx spray of 3 lb. lead arsenate, a first cover spray of 1 gal. oil with 2 lb. lead arsenate, a second and third cover spray of fish-oil with 2 lb. lead arsenate, a fourth cover spray identical with the calyx spray, and a fifth and sixth cover spray of 1 gal. oil and 0.5 pt. nicotine. The foliage in this case showed practically no scorching and was free from injury by leafhoppers and mites. The residue was 0.061 as compared with 0.078 in a plot treated with lead arsenate only.

SPULER, A., SPULER, F. L., and GREEN, E. L. (1663)

1931. OIL SPRAYS FOR SUMMER USE. Wash. Agr. Expt. Sta. Bull. 252, 39pp., illus. [Abstract in Rev. Appl. Ent. (A) 19: 581-582. 1931.]

With regard to the codling moth, nicotine sulphate and oil sprays have been as effective as lead arsenate (2 lb. to 100 gal.) in preventing entry into the fruit, when used in any or all the cover sprays, and have been decidedly more effective than lead arsenate in preventing "stings."

WEBSTER, R. L. (1664)

1931. TRENDS IN CODLING MOTH CONTROL IN THE PACIFIC NORTHWEST. Jour. Econ. Ent. 24: 672-676. [Abstract in Rev. Appl. Ent. (A) 19: 543-544. 1931.]

The oil-nicotine combination, consisting of 1 gal. summer oil and nicotine sulphate (3/4 pt. to 100 gal.), is recommended to replace lead arsenate late in the season on account of the residue problem. It has proved fully as efficient as lead arsenate for cover sprays against the second brood. Foliage treated with cover sprays, including the oil-lead arsenate combination together with nicotine-oil, was found to be particularly free from injury by red spider, leafhoppers, and aphids.

LATHROP, F. H., and SAZAMA, R. F. (1665)

1932. A LABORATORY-FIELD METHOD FOR THE STUDY OF THE EFFICIENCY OF CODLING MOTH SPRAYS. Jour. Econ. Ent. 25 (1): 83-101, illus. [Abstract in Rev. Appl. Ent. (A) 20: 290-292. 1932.]

The treatments included lead arsenate and lime for the first brood followed by summer oil with or without nicotine sulphate for the second. The orchard results show that the oil-nicotine spray was somewhat superior to lead arsenate and lime, probably as the result of superior ovicidal effects. In regard to 1 percent oil with nicotine (1:1,600), there was a decrease in coloration of the fruit of selected apples, but no material injury to foliage was observed.

MOORE, WM. (1666)

1932. COMPARISONS BETWEEN NICOTINE TANNATE AND ARSENATE OF LEAD AS CODLING MOTH POISONS. Jour. Econ. Ent. 25 (3): 554-559. [Abstract in Rev. Appl. Ent. (A) 20: 515. 1932.]

Foliage treated with nicotine tannate under New Jersey conditions has shown that about 75 percent of the nicotine has usually disappeared at the end of 10 days (Rev. Appl. Ent. (A) 19: 358), but a determinable amount always remains for 30 days or more. These small residues seem to control the codling moth better than lead arsenate. Subsequent studies of the toxicity of nicotine tannate have shown that it kills the more mature eggs and crawling larvae as a contact poison and persists as a stomach poison on foliage in quantities toxic to the young larvae for at least 21 days. The cost of nicotine tannate is not greater than that of lead arsenate, and the former appears to exceed the latter in toxicity. Tannic acid is only satisfactory when made from Chinese galls (Rhus semialata),inferior tannins causing severe foliage injury. The tank should be filled two-thirds full of water, and after the agitator has been started, 2 lb. tannic acid should be added for each 100 gal. After this has dissolved, 1 pt. 50-percent free nicotine for each 3 lb. tannic acid should be added and the tank filled up before applying the spray. Nicotine tannate can be used with pure sulphur but cannot be mixed with soap, lime-sulphur, calcium caseinate, or other alkaline or acid substances. Its compatibility with dried milk or other protein or organic base is open to question.

NEWCOMER, E. J., et al. (1667)

1932. A CODLING MOTH CONTROL SCHEDULE FOR 1932. Wash. State Hort. Assoc. Proc. 27 (1931), pp. 46-50, illus.; also in Better Fruit 26 (8): 8-9, illus. [Abstract in Rev. Appl. Ent. (A) 20: 278. 1932.]

Oil emulsions may be safely used with lead arsenate in the second and subsequent cover sprays, provided that lime-sulphur has not been applied too late in the spring. After July they must be combined with some other insecticide, such as nicotine sulphate (1/2 or 2/3 pt. per 100 gal.), etc.

NEWCOMER, E. J., and YOTHERS, M. A. (1668)

1932. EXPERIMENTS WITH INSECTICIDES FOR CODLING-MOTH CONTROL. U. S. Dept. Agr. Tech. Bull. 281, 28pp., illus. [Abstract in Rev. Appl. Ent. (A) 20: 367-368. 1932.]

Nicotine sulphate was somewhat toxic to the eggs and larvae of the codling moth in warm weather, but by itself was of less value than lead arsenate. Of the materials tested to prevent too rapid volatilization of the nicotine, lubricating oil gave the best results, and a very good control was obtained with a combination of nicotine sulphate (1:800 or 1:1,600) and 1 percent lubricating oil. This combination is of value when substituted for lead arsenate in one or more cover sprays.

SPULER, A., et al. (1669)

1932. FACTORS INFLUENCING THE COST OF CODLING MOTH CONTROL. Wash. State Hort. Assoc. Proc. 27 (1931), pp. 31-43, illus. FACTORS LIMITING THE USE OF LEAD ARSENATE FOR CODLING MOTH CONTROL. Better Fruit 26 (8): 5-7, illus. [Abstract in Rev. Appl. Ent. (A) 20: 277-278. 1932.]

Nicotine, when used alone, appears to be of little value against the codling moth. The use of mineral oil with nicotine sulphate or pyrethrum increases the time the nicotine or pyrethrum remains on the fruit, and the spray combines both ovicidal and larvicidal properties and controls other pests such as aphids and mites. A spray of oil (1:100) combined with nicotine sulphate (1:1,600) proved as effective against the codling moth as lead arsenate when used in any or all of the cover sprays, and also controls other pests and avoids an excessive deposit of arsenical.

STEARNS, L. A., HADEN, W. R., and MACCREARY, D. (1670)

1932. RESULTS WITH SOME OF THE SPRAYS SUGGESTED RECENTLY FOR IMPROVED CODLING-MOTH CONTROL. Peninsula Hort. Soc. [Del.] Trans. 1932: 78-88. [Abstract in Chem. Abs. 28: 5379. 1934.]

Substitution of nicotine tannate or Verdol for lead arsenate in the second and third-brood cover sprays did not give increased control of the codling moth on apples, but greatly reduced the arsenical residue on the fruit.

WEBSTER, R. L. (1671)

1932. DIVISION OF ENTOMOLOGY. Wash. Col. Agr. Expt. Sta. Bull. 275, pp. 31-34.

The nicotine-oil combination, when used in the late cover sprays, has given excellent results for several years when directed especially against the codling moth. This treatment and that of lead arsenate are approximately equal in their efficiency.

Nicotine tannate, when combined with emulsified mineral oil in the last two cover sprays, gave protection equal to a straight lead arsenate treatment on apples.

CROSBY, C. R., MILLS, W. D., and BLAUVELT, W. E. (1672)

1933. PROTECTING ORCHARD CROPS FROM DISEASES AND INSECTS. N. Y. [Cornell] Agr. Expt. Sta. Bull. 498 (revised), 83 pp., illus. [Abstract in Rev. Appl. Ent. (A) 22: 300. 1934.]

Spraying twice a month (a calyx and 6 cover sprays) with 2.5 lb. lead arsenate and 2 gal. summer oil in 100 gal. water gave 96 percent uninjured fruit in 1933, and the residue was easily removed. To make washing unnecessary, 1 pt. nicotine may be substituted for the arsenical in the last four sprays.

CUTRIGHT, C. R., and HOUSER, J. S. (1673)

1933. EXPERIMENTAL RESULTS IN CODLING MOTH CONTROL WITH LATE SUMMER OIL APPLICATIONS. Jour. Econ. Ent. 26 (2): 380-383. [Abstract in Rev. Appl. Ent. (A) 21: 333. 1933.]

The trend of results in experiments in which nicotine sulphate was added to the oil slightly favors lead arsenate, but the difference is very small.

FOWLER, R. (1674)

1933. SPRAYING EXPERIMENTS FOR CODLING MOTH CONTROL - BLACKWOOD, 1931-32. Jour. Dept. Agr. So. Aust. 36 (6): 647-660, illus. [Abstract in Rev. Appl. Ent. (A) 21: 265. 1933.]

The general results indicated that it is possible in a year of heavy crop of fruit to control the codling moth with five sprays of lead arsenate (4 lb. per 100 gal.) with the addition of a spreader in the last four, but the substitution of an oil and nicotine sulphate spray for the last one increases the effectiveness. The cost is a little higher, but the arsenical residue is decreased to within export tolerance. By using combined oil-arsenate sprays good results can be obtained with 3 lb. arsenate and 3/4 gal. oil in 100 gal., the oil-nicotine combination being used in the last cover spray.

HARMAN, S. W. (1675)

1933. CODLING MOTH CONTROL. N. Y. [Geneva] Agr. Expt. Sta. Bull. 627, 31 pp., illus. [Abstract in Rev. Appl. Ent. (A) 21: 461-462. 1933.]

Nicotine sulphate in combination with oil sprays proved an effective substitute for lead arsenate in the fourth cover spray (p. 462).

JARVIS, H. (1676)

1933. CODLING MOTH CONTROL EXPERIMENTS, 1930-33. Queensland Agr. Jour. 40 (1): 25-34. [Abstract in Rev. Appl. Ent. (A) 21: 570-571. 1933.]

In an attempt to discover a material harmless to man and as efficient as lead arsenate in sprays against the codling moth, several substances were applied four times. White oil alone (1:64) gave as good control (nearly 98 percent) as lead arsenate. Combinations of oil (1:80) with nicotine sulphate (1:640) were slightly more efficient, but much more expensive.

LOCKWOOD, S. (1677)

1933. A REVIEW OF CODLING MOTH CONTROL MEASURES. Calif. Dept. Agr. Monthly Bull. 22 (2-3): 170-178. [Abstract in Rev. Appl. Ent. (A) 21: 595. 1933.]

For those with equipment for washing their fruit, it is recommended that the lead arsenate in the second cover spray be reduced from 3 to 2 lb. per 100 gal., followed on late-ripening fruits by a third cover spray of 3/4 pt. nicotine sulphate and 1 gal. oil in 100 gal. water (Rev. Appl. Ent. (A) 19: 544). Where the fruits are only to be wiped, oil-nicotine should be used for the second cover spray also.

MOORE, Wm. (1678)

1933. A NEW DEVELOPMENT IN THE FIXATION OF NICOTINE. Jour. Econ. Ent. 26 (3): 723-726. [Abstract in Rev. Appl. Ent. (A) 21: 474-475. 1933.]

Attempts to prevent the dissolving away of nicotine tannate on sprayed fruit and foliage have failed, but a new insoluble nicotine insecticide has now been prepared by heating an aqueous solution of nicotine, resorcinol and formaldehyde. A finely divided precipitate is obtained. The washed, air-dried product contains about 22 percent nicotine, which dissolves in water to the extent of 0.004 g. in 100 cc. as against 0.015 - 0.02 g. of the nicotine in nicotine tannate. Prepared as a paste, the new material was mixed with oil and applied to apples by dipping. Its toxicity to the codling-moth larvae was about equal to that of nicotine tannate, and the deposit left by it was about twice as resistant to washing with water.

NEWCOMER, E.J., ROLFS, A. R., and DEAN, F.P. (1679)

1933. A PRACTICAL TEST OF CHEMICALLY TREATED BANDS FOR THE CONTROL OF THE CODLING MOTH. Jour. Econ. Ent. 26: 1056-1058.

In the spray schedule, nicotine sulphate (1:1,200) plus oil emulsion was used for the last two sprays, but no results are stated.

OVERLEY, F. L., OVERHOLSER, E. L., and ST. JOHN, J. L. (1680)

1933. WASHING EXPERIMENTS IN 1933 WITH SPECIAL REFERENCE TO NEW SPRAYS. Wash. State Hort. Assoc. Proc. 29th Ann. Meeting, pp. 79-85. [Abstract in Chem. Abs. 28: 4529. 1934.]

Spray residue removal was complicated by the use of nicotine sulphate-mineral oil combinations for second brood sprays following heavy applications of lead arsenate for first brood sprays. Fish oil-nicotine combinations did not interfere with the removal of either arsenic or lead and seemed to be advantageous when sodium silicate washing solutions were used.

SHERMAN, F. III (1681)

1933. A SUMMARY OF THREE YEARS' EXPERIMENTS ON THE CONTROL OF CODLING MOTH IN SOUTHWESTERN MICHIGAN. Jour. Econ. Ent. 26 (2): 383-392. [Abstract in Rev. Appl. Ent. (A) 21: 333-334. 1933.]

Tests carried out from 1930 to 1932, some of which have already been noticed (Rev. Appl. Ent. (A) 20: 34), have shown that lead arsenate, 2 percent summer oil, and a combination of 1 percent summer oil and nicotine sulphate (3/4 pt. to 100 gal.) will give good control in heavily infested orchards. The use of non-arsenicals in the summer sprays kept the arsenical residues in most cases within the limits of tolerance.

WEBSTER, R. L., MARSHALL, J., MILLER, C. E., and HANSBERRY, T. R. (1682)

1933. FISH OILS, SPREADERS AND NON-ARSENICALS FOR CODLING MOTH CONTROL. Wash. State Hort. Assoc. Proc. 28 (1932): 48-64, illus. [Abstract in Rev. Appl. Ent. (A) 21: 318. 1933.]

An oil-nicotine combination in second-brood cover sprays has continued to give as good control as lead arsenate.

WORTHLEY, H. N. (1683)

1933. SPRAYING FOR CODLING-MOTH CONTROL. Pa. Agr. Expt. Sta. Bull. 285, pp. 2-16. [Abstract in Chem.Abs. 28: 3828. 1934.]

Nicotine tannate used as a substitute for lead arsenate was of no value.

ANONYMOUS (1684)

1934. CODLING MOTH AND OTHER ORCHARD PESTS. Ill. State Hort. Soc. Trans. 1933, 67, 516pp., illus. [Abstract in Rev. Appl. Ent. (A) 22: 453-455. 1934.]

Farrar determined that 1 percent summer oil with nicotine sulphate (1:800) has proved a satisfactory substitute for arsenicals against the second and third broods of the codling moth. Flint found that in years when this insect is excessively abundant, oil-nicotine sprays must be applied at intervals of 7 to 10 days when second-brood hatching is at its maximum.

CORY, E. N. (1685)

1934. NOTES ON CODLING MOTH CONTROL IN 1933. Jour. Econ. Ent. 27: 509-514.

Nicotine was used in combination with arsenicals and fungicides, but the reviewer cannot tell what effect the nicotine had by referring to the table given.

DRIGGERS, B. F., and PEPPER, B. B. (1686)

1934. COMPARATIVE TESTS OF ARSENICALS, ARSENICALS WITH OIL AND SEVERAL NICOTINE COMPOUNDS USED AGAINST THE CODLING MOTH. Jour. Econ. Ent. 26: 249-258.

The results show clearly that nicotine tannate when used with bentonite-sulphur gave a better control of codling moth than any of the other materials used. The data also indicate that nicotine tannate alone is not so effective as nicotine tannate with bentonite-sulphur. Nicotine sulphate with bentonite, nicotine sulphate with bentonite-sulphur, a half charge of nicotine tannate with oil and nicotine sulphate with oil all produced more clean fruit than either the standard lead arsenate or lead arsenate with summer oil (p. 257).

------- and PEPPER, B. B. (1687)

1934. BENTONITE COMPOUNDS AS AGENTS FOR THE RETENTION OF NICOTINE ON APPLE FOLIAGE AND FRUIT IN CODLING MOTH CONTROL. Jour. Econ. Ent. 27(2): 432-440.

Their conclusions are: (1) Bentonite-sulphur "fixes" and (or) "sticks" the nicotine of nicotine tannate and nicotine sulphate to the foliage of apple more firmly than when these two nicotine compounds are used alone; (2) By retaining the nicotine in larger amounts and over a longer period of time bentonite-sulphur when used with relatively unstable nicotine compounds prolongs the toxicity of these compounds to codling moth larvae, and, therefore, increases the efficiency of these compounds when used as a control for codling moth (p. 440).

FLINT, W. P. (1688)

1934. CODLING MOTH CONTROL BY THE USE OF INSECTICIDES IN MICHIGAN,OHIO, INDIANA AND ILLINOIS. Jour. Econ. Ent. 27: 141-143.

In Michigan, when an equal number of applications of lead arsenate, oil-nicotine, and nicotine tannate were made, the lead arsenate was superior; but with an increased number of applications the nicotine-oil combinations approached the percentages of control obtained with lead arsenate. Nicotine tannate was no better than oil-nicotine.

In Ohio, oil-nicotine was very close to lead arsenate in efficiency. In Indiana, nicotine tannate gave satisfactory control but with moderate to severe injury on Winesaps and Jonathan and caused considerable discomfort to the men applying it.

In Illinois, the oil-nicotine combinations gave inferior control when used in second brood tests unless the number of applications was increased over those of lead arsenate.

GOULD, E. (1689)

1934. CODLING MOTH CONDITIONS AND CONTROL IN WEST VIRGINIA. Jour. Econ. Ent. 27: 229-232.

Of the many non-lead arsenicals and non-arsenicals, among which were oils and nicotine sulphate, used singly and in various combinations in the experimental plots in 1933, none gave promise as an immediate substitute for lead arsenate (p. 230).

HARMAN, S. W. (1690)

1934. STATUS OF THE CODLING MOTH IN THE NORTHEASTERN STATES. Jour. Econ. Ent. 27: 143-145.

Recent work in New York showed lead arsenate to be the most reliable single material for combating the codling moth. The combination of nicotine and oil has given most promise as a substitute. (p. 144).

------- (1691)

1934. CODLING MOTH CONTROL EXPERIMENTS DURING 1933. Jour. Econ. Ent. 27: 222-225.

Among the materials that gave the best control with 5 summer applications was 3 lb. lead arsenate in the first codling moth spray, followed by 3 qt. of summer oil and 1 pt. of nicotine sulphate in the next four applications. These amounts were used in 100 gal. of water. The results were as follows:

Treatment (5 cover sprays. Material in 100 gal. water)	Percent stings	Percent worms	Percent Total injury
Lead arsenate 3 lb.	60	13	73
Nicotine tannate (3 qt. tannin extract No. 50 + 1 qt. Black Leaf 50)	7	82	89
Nicotine tannate + 1 qt. oil	25	50	75
Nicotine-oil (1st cover, lead arsenate 3 lb. Remaining sprays, nicotine sulphate 1 pt., oil 3 qt.)	29	14	43

HODGKISS, H. E., WORTHLEY, H. N., and HALEY, D. E. (1692)

1934. CODLING MOTH IN PENNSYLVANIA. Jour. Econ. Ent. 27: 232-239.

In 1932 a complete cover spray schedule of nicotine tannate with flotation sulphur was not promising (p. 236).

HOUGH, W. S. (1693)

1934. CODLING MOTH CONTROL IN VIRGINIA. Peninsula Hort. Soc. [Del.] Trans. 1933, pp. 35-38. [Abstract in Rev. Appl. Ent. (A) 22: 298-299. 1934.]

A spray of 1 gal. summer oil and 1 pt. nicotine sulphate to 100 gal. gave about the same degree of control as lead arsenate. It would have to be applied every 8 to 10 days during the chief period of oviposition.

------- (1694)

1934. COLORADO AND VIRGINIA STRAINS OF CODLING MOTH IN RELATION TO THEIR ABILITY TO ENTER SPRAYED AND UNSPRAYED APPLES. Jour. Agr. Res. 48: 533-553, illus. [Abstract in Rev. Appl. Ent. (A) 22: 499. 1934.]

Nicotine was one of the spray solutions used. The Colorado larvae were more able to enter the sprayed fruit.

------- (1695)

1934. NICOTINE KILLS CODLING MOTHS. Jour. Econ. Ent. 27: 1102-1103.

A spray mixture containing Black Leaf 40, when applied in a heavily infested orchard, caused 77 codling moths to fall on a sheet under a sprayed tree. All died but 6. The moths suffered paralysis of the wings and were incapable of flight. Only volatile nicotine appeared to kill moths. Nicotine bentonite or nicotine sulphate with oil was not effective. Nicotine was liberated by the addition of lime to the spray containing fixed nicotine. The data indicate that 85 to 90 percent of the moths may be killed in the trees at the time of spraying.

KNIGHT, H., and CLEVELAND, C. R. (1696)

1934. RECENT DEVELOPMENTS IN OIL SPRAYS. Jour. Econ. Ent. 27: 269-289, illus.

The results, as reported in a table, show that an oil preparation containing glyceryl-oleate is superior to a corresponding treatment of a mayonnaise type of summer oil emulsion combined with calcium arsenate or nicotine sulphate, in controlling the codling moth (p. 283).

McLEAN, H. C., and WEBER, A. L. (1697)

1934. INFLUENCE OF SPRAY SCHEDULE AND OTHER FACTORS ON SPRAY RESIDUE REMOVAL. Jour. Econ. Ent. 27: 168-180.

Oil-lead arsenate sprays may be applied at 27 and 37 days after petal-fall, followed by oil-nicotine sprays, without resulting in spray residues in excess of the Federal tolerance on fall and winter varieties of apples at harvest.

MARSHALL, J., and GROVES, K. (1698)

1934. NON-LEAD SPRAYS FOR CODLING MOTH. Wash. State Hort. Assoc. Proc. 29 (1933), pp. 39-60. [Abstract in Rev. Appl. Ent. (A) 22: 216-217. 1934.]

Fish oil (0.25 percent) was about as effective with nicotine sulphate (1 to 200) as mineral oil, and this mixture may prove useful against the second brood, in view of the difficulty experienced in the removal of residue when nicotine sulphate and mineral oil has been applied after lead arsenate. It is concluded that lead arsenate remains the most satisfactory single spray material for the codling moth, and lead arsenate and fish oil the best combination.

NETTLES, W. C. (1699)

1934. THE CODLING MOTH IN SOUTH CAROLINA. S. C. Agr. Expt. Sta. Bull. 295, 30 pp., illus. [Abstract in Expt. Sta. Rec. 71: 672. 1934.]

Tannic acid 1 lb. to 50 gal. plus Nicotine 50 at the rate of 0.5 pt. to 50 gal. gave considerable control, but is considered unsuitable for use under South Carolina conditions.

NEWCOMER, E. J. (1700)

1934. THE STATUS OF CODLING MOTH CONTROL IN THE PACIFIC NORTHWEST. Jour. Econ. Ent. 27: 139-141.

Many growers used the nicotine-oil combination for the second brood, with satisfactory results, but this interfered somewhat with cleaning the fruit, especially if heavy applications of lead arsenate had been made earlier. A few growers used this combination after the first cover spray with fair success, but such a schedule is expensive, and in many instances it cannot be employed, owing to injury by the oil.

PARROTT, P. J. (1701)

1934. EXPERIENCES WITH THE CODLING MOTH IN NEW YORK DURING 1933. Jour. Econ. Ent. 27: 218-222.

In the experiments nicotine tannate and nicotine were used. Among the various insecticides tried, nicotine with oil was one of three which proved superior to all others. While nicotine with oil possesses useful properties, its field of usefulness is restricted (p. 221).

SMITH, L. B., and HODGKISS, H. E. (1702)

1934. MODIFYING THE CODLING MOTH CONTROL PROGRAM. Jour. Econ. Ent. 27: 244-249.

In the spray program nicotine sulphate (1 pt. to 100 gal. spray) is used to control red bugs. Nicotine is also used in the second or third cover sprays to help control the codling moth.

In the modified spray program a pint of nicotine sulphate was used in the petal fall, and first and second cover sprays.

SMITH, R. H., MEYER, H. U., and PERSING, C. O. (1703)

1934. NICOTINE VAPOR IN CODLING MOTH CONTROL. Jour. Econ. Ent. 27: 1192-1195, illus.

A nicofumer and a portable fumatorium are described and illustrated. The former is a device for utilizing nicotine in the form of vapor or finely atomized mist in the control of insect pests. The latter is used to control the codling moth with nicotine vapor, and all the moths in a tree 24 ft. high and 24 ft. wide may be killed with a dosage of 10 cc. of Black Leaf 50. The rate of treatment is one tree per minute. In preliminary tests codling moths subjected for only 2 or 3 sec. to a blast of concentrated nicotine vapor were paralyzed and died.

STEARNS, L. A. (1704)

1934. THE PROBLEM OF CODLING MOTH CONTROL IN DELAWARE. Jour. Econ. Ent. 27: 225-229.

Recent experimental evidence suggests more effective second brood control by using a series of 3 nicotine-oil sprays to be applied early in July, late in July, and early in August (p. 228).

STEARNS, L. A., MACCREARY, D., and HADEN, W. R. (1705)

1934. EXPERIENCE, DURING 1933, WITH ARSENICALS AND ARSENICAL SUBSTITUTES APPLIED ON APPLE FOR CONTROL OF CODLING MOTH. Peninsula Hort. Soc. [Del.] Trans. 1933, pp. 20-28. [Abstract in Rev. Appl. Ent. (A) 22: 298. 1934.]

The most effective schedule consisted of 3 cover sprays of 4 lb. lead arsenate, 10 lb. flotation sulphur, and 5 lb. hydrated lime in 100 gal. water with the addition of fish oil in the first and second (1 pt. and 1 qt. respectively), against the first brood, and 3 of 1 pt. nicotine sulphate, 1 gal. oil and 8 lb. hydrated lime in 100 gal. bordeaux mixture against the second brood. Nicotine tannate was not satisfactory.

WAKELAND, C., and HAEGELE, R. W. (1706)

1934. CODLING MOTH CONTROL IN IDAHO. Idaho Agr. Expt. Sta. Bull. 200, 36 pp., illus. [Abstract in Expt. Sta. Rec. 71: 511-512, 1934.]

The use of Black Leaf 40, 2/3 pt., and oil emulsion, 1 gal. to 100 gal. of dilute spray, is about equally as effective as lead arsenate, and this combination may be substituted for lead arsenate if desired.

WEBSTER, R. L. (1707)

1934. THE STATUS OF CODLING-MOTH CONTROL WITH INSECTICIDES. N. Y. State Hort. Soc. Proc. 79th Ann. Meeting, pp. 33-36. [Abstract in Chem. Abs. 28: 3827. 1934.]

Numerous tests conducted in Washington State indicated that the value of lead arsenate substitutes for codling-moth control is in the decreasing order nicotine-oil combinations, fluorine compounds (especially cryolite), manganese arsenate, and calcium arsenate.

------- (1708)

1934. THE STATUS OF CODLING MOTH CONTROL WITH INSECTICIDES. Jour. Econ. Ent. 27: 134-139.

An attempt was made to rank insecticides, other than lead arsenate, so far as their value for codling moth control was concerned, and it was generally agreed that nicotine-oil would rate first.

Owing to difficulty in removing lead-arsenate residue in Washington State, the writer is reluctant to advise the use of mineral oil in late cover sprays either with nicotine or lead arsenate.

WEBSTER, R. L., and MARSHALL, J. (1709)

1934. THE POSITION OF NICOTINE IN CODLING MOTH CONTROL. Jour. Econ. Ent. 27: 873-878.

In a spray schedule of oil-nicotine in the last three cover applications, oil-lead arsenate in second cover, lead arsenate 3-100 in remaining cover sprays, codling moth control was greatly improved over lead arsenate 3-100 for six cover sprays on Delicious in 1933. The use of mineral oil following lead arsenate made lead residue removal more difficult than when lead arsenate was used alone.

WHITE, W. B. (1710)

1934. THE CURRENT SEASON'S EXPERIENCE IN ENFORCING SPRAY RESIDUE TOLERANCES. Jour. Econ. Ent. 27: 125-133.

The author, who is employed by the U. S. Food and Drug Administration, says the following (p. 132): "Whether nicotine and oil or some of the other organic insecticides will completely displace lead arsenate in the control of late broods of the codling moth is not certain." He predicts that the consumer and agencies which protect his health are not going to accept with complacence the exploitation of new insecticides until these materials are tested by absolutely disinterested scientists to establish, as conclusively as can be done, the probable or possible effect on the human health of the quantities of these insecticides which unavoidably remain on the product at the time of consumption.

WORTHLEY, H. N. (1711)

1934. CODLING MOTH SPRAYING EXPERIMENTS IN PENNSYLVANIA IN 1933. Jour. Econ. Ent. 27: 240-244.

Nicotine-oil left a rather dull finish in contrast to the bright lively red color in the blocks sprayed with other materials.

Codling-moth control in heavily infested orchards in southern Pennsylvania can be obtained best with 3 lb. lead arsenate plus 2/3 lb. skim milk powder per 100 gal., with liquid lime sulphur and with nicotine sulphate in one application at the peak of first brood oviposition. To avoid necessity of washing, nicotine-oil as a substitute for lead arsenate should be used after the third cover spray on late varieties and after the second cover spray on early varieties. Its use is objectionable due to cost and incompatibility with the standard fungicide. To avoid danger of injury, lime-sulphur should be omitted from the spray next preceding the substitution of oil-nicotine.

3. Oriental Peach Moth, 1917-1930

GARMAN, P. (1712)

1917. THE ORIENTAL PEACH PEST. Md. Agr. Expt. Sta. Bull. 209, 16 pp., illus. [Abstract in Rev. Appl. Ent. (A) 6: 369-370. 1918.]

The complete course of treatment against the oriental peach moth, (Laspeyresia) Grapholitha molesta Busck., is: concentrated lime-sulphur 1:9 when the buds swell; self-boiled lime-sulphur 8:8:50 with calcium arsenate and nicotine after the petals fall, the same mixture being applied 2, 8, and 12 weeks later. Applications of tobacco (nicotine sulphate or Black Leaf 40) and soap cannot be recommended for combating this pest.

WOOD, W. B., and SELKREGG, E. R. (1713)

1918. FURTHER NOTES ON LASPEYRESIA MOLESTA. Jour. Agr. Res. 13: 59-72, illus. [Abstract in Rev. Appl. Ent. (A) 6: 373-374. 1918.]

Negative results were obtained with 40 percent nicotine sulphate (1:400) and with a combination spray of lead arsenate and nicotine sulphate. Other attempted remedial measures included immersing the cocoons containing hibernating larvae of the oriental peach moth in miscible oils and nicotine sulphate.

ANONYMOUS (1714)

1919. INSECT INVESTIGATIONS. Md. Agr. Expt. Sta. Ann. Rept. 32 (1918-1919), II-VII. [Abstract in Rev. Appl. Ent. (A) 8: 249. 1920.]

Further experiments in the control of the oriental peach moth, (Laspeyresia) Grapholitha molesta Busck, indicate that orchards can be protected by thoroughly spraying with a combination of self-boiled lime-sulphur, nicotine sulphate, and a satisfactory spreader, such as lime caseinate.

CORY, E. N. (1715)

1919. THE STATUS OF THE ORIENTAL PEACH MOTH. Jour. Econ. Ent. 12: 81-84. [Abstract in Rev. Appl. Ent. (A) 7: 223-224. 1919.]

Nicotine sulphate 1:500 or 1:800 kills about 70 percent of the eggs of *(Laspeyresia) Grapholitha molesta* (oriental peach moth).

PETERSON, A. (1716)

1920. SOME STUDIES ON THE EFFECT OF ARSENICAL AND OTHER INSECTICIDES ON THE LARVAE OF THE ORIENTAL PEACH MOTH. Jour. Econ. Ent. 13: 391-398.

Nicotine (1 to 500 soap solution), nicotine resinate (1 to 500), and tobacco dust were tried against these larvae, *(Laspeyresia) Grapholitha molesta* Busck), but they were found ineffective (pp. 395-396).

STEARNS, L. A. (1717)

1920. EXPERIMENTS ON THE CONTROL OF THE ORIENTAL FRUIT MOTH (*LASPEYRESIA MOLESTA* BUSCK). Va. State Crop Pest Comn. Quart. Bull. 2 (1), 16 pp., illus. [Abstract in Rev. Appl. Ent. (A) 8: 354-355. 1920.]

In detailed laboratory tests and as applied to single trees in the orchard, Black Leaf 40 as an ovicide, and nicotine-arsenical combinations in applications near hatching time, have proved most effective, a three-fourths control having been secured.

------- (1718)

1921. PARASITISM AND NICOTINE IN THE CONTROL OF THE ORIENTAL PEACH MOTH: A SECOND REPORT. Jour. Econ. Ent. 14: 336-341. [Abstract in Rev. Appl. Ent. (A) 10: 69. 1922.]

Nicotine at 1 to 1,600 produced practically no check on the hatching of the eggs, but its effectiveness was slightly increased by a caseinate spreader at the rate of 1 lb. to 50 gal. or sea moss at the rate of 2 lb. to 50 gal. A dilution of 1 to 800 reduced the hatching by about two-thirds and a dilution of 1 to 500 reduced it by about three-fourths. An arsenical and nicotine spray did not satisfactorily kill the young larvae.

TROUVELOT, B. (1719)

1923. *LASPEYRESIA MOLESTA* BUSCK. Rev. Zool. Agr. et Appl. 22: 14-22, illus.

Spraying with nicotine sulphate in America has destroyed as high as 75 percent of the eggs of this moth on peach trees. Using the same material, Black Leaf 40 (1:800), applications should be made in France on May 17, June 2, July 27, and August 28, corresponding approximately to the time of oviposition (p. 22).

CORY, E. N. (1720)

1924. ORIENTAL PEACH MOTH, JAPANESE BEETLE AND EUROPEAN RED MITE. Md. Agr. Soc. Rept. 8 (1923): 164-171. [Abstract in Rev. Appl. Ent. (A) 13: 37. 1925.]

Nicotine sprays destroy the eggs of the oriental peach moth (Grapholitha molesta Busck) but are not generally recommended as it is difficult to time their application so as to obtain satisfactory results. Where, however, injury is very severe the addition of nicotine (1:800) to the regular sprays may be of value.

HEADLEE, T. J. (1721)

1924. POINTS IN THE LIFE HISTORY AND HABITS OF THE ORIENTAL PEACH MOTH AND RECOMMENDATIONS FOR CONTROL. N. J. State Hort. Soc. Proc., pp. 92-94.

Recommendations for the season of 1925 include "Spray according to the regular schedule, adding 40-percent nicotine to each treatment," etc. (p. 94).

PETERSON, A. (1722)

1925. ORIENTAL PEACH MOTH IN THE SEASON OF 1923. N. J. Agr. Expt. Sta. Rept. 1923-24, pp. 291-294. [Abstract in Rev. Appl. Ent. (A) 14: 144. 1926.]

Spraying with 40-percent nicotine sulphate to destroy the eggs of the second and later broods of the oriental peach moth ((Laspeyresia) Grapholitha molesta Busck) gave no material reduction in infestation of the fruit.

STEARNS, L. A. (1723)

1925. ORCHARD CONTROL WORK OF 1924 AGAINST THE ORIENTAL PEACH MOTH IN SOUTHERN NEW JERSEY. Jour. Econ. Ent. 18: 191-199, illus. Abstract in Rev. Appl. Ent. (A) 13: 253-254. 1925.]

A combination spray of nicotine (1:800), added to fungicidal-lead arsenate, 1 lb. to 50 gal., resulted in an increase of 13.3 percent in th peaches free from this pest.

ANONYMOUS (1724)

1926. ANNUAL REPORT 1926. Pa. Dept. Agr. Bull. IX, No. 23, Gen. Bull. 436, 85 pp., illus. [Abstract in Rev. Appl. Ent. (A) 16: 274-275. 1928

No control measures tried against the oriental fruit moth ((Laspey-resia) Grapholitha molesta Busck) have given complete satisfaction.

Pyrethrum soap emulsion and sodium fluosilicate have proved more effective against the larvae than nicotine.

GARMAN, P. (1725)

1926. THE ORIENTAL PEACH MOTH IN 1925. Conn. Agr. Expt. Sta. Bull. 275, pp. 280-286, illus. [Abstract in Rev. Appl. Ent. (A) 14: 441-442. 1926.]

Recommendations for control of Grapholitha molesta Busck include spraying with nicotine sulphate. Injury resulted from using 4 lb. potash fish-oil soap in 50 gal. nicotine spray.

Reducing the soap to 2 lb. obviated this. Nicotine dust caused no damage but cannot be used less than 3 weeks before picking time as it is apt to cling to the fruit. Nicotine soap sprays have not this disadvantage.

STEARNS, L. A. (1726)

1926. ORIENTAL PEACH MOTH INVESTIGATIONS. N. J. Agr. Expt. Sta. Rept. 1924-25, pp. 386-402. [Abstract in Rev. Appl. Ent. (A) 15: 302-303. 1927.]

Preliminary tests against the hibernacula with lime-sulphur, nicotine sulphate, various commercial oils, and coal-tar derivatives, etc., were decidedly negative.

HARUKAWA, C., and KONDO, S. (1727)

1927. THE USE OF NICOTINE SULPHATE IN CONTROLLING LASPEYRESIA MOLESTA BUSCK. Kontyu 2 (2): 114-117. [In Japanese. Abstract in Rev. Appl. Ent. (A) 15: 641. 1927.]

Spraying with nicotine sulphate was found to reduce the loss caused to pears by (Laspeyresia) Grapholitha molesta Busck by 50 to 75 percent.

STEARNS, L. A. (1728)

1927. A REPORT OF THE INVESTIGATION OF THE ORIENTAL PEACH MOTH (LASPEYRESIA MOLESTA BUSCK) FOR 1925. N. J. Agr. Expt. Sta. Rept. 1925-26, pp. 184-195, illus. [Abstract in Rev. Appl. Ent. (A) 16: 133-134. 1928.]

The average increase in clean fruit resulting from fungicidal-arsenical-nicotine treatment (Rev. Appl. Ent. (A) 13: 254) in 1925 was 8.65 percent as compared with 13 percent in 1924, the variations in the results being probably due to parasitism and the earlier autumn in 1925.

HEADLEE, T. J., ET AL. (1729)

1928. REPORT OF THE DEPARTMENT OF ENTOMOLOGY. N. J. Agr. Expt. Sta. Rept 1928, pp. 125-164, 169, 170, 172-189, illus. [Abstract in Expt. Sta. Rec. 61: 749-752. 1929.]

In work with the oriental peach moth B. F. Driggers reports upon insecticidal studies. In laboratory work with liquid sprays, Volck oil at 1 and 1.5 percent actual oil, nicotine sulphate, and a white oil extract of pyrethrum proved the most effective in killing the eggs and young larvae after they emerged from the eggs. Nicotine sulphate alone was much more effective in killing eggs in the black spot stage and just emerged larvae than was nicotine sulphate with resin fish-oil soap added (p. 750).

In laboratory tests with several nicotine dusts, a much greater kill of the eggs and young larvae was obtained when the twigs were dusted while wet. This is thought to have been due to the adherence of more dust to the wet than to the dry foliage. Field tests were made with nicotine sulphate (1:800), applied 5 times, but there seems to have been little control. Tobacco dust was also used in this study (p. 750).

STEARNS, L. A. (1730)

1928. THE ORIENTAL FRUIT MOTH (LASPEYRESIA MOLESTA BUSCK). Ohio Agr. Expt. Sta. Bimonthly Bull. 13 (2): 35-43, illus. [Abstract in Rev. Appl. Ent. (A) 16: 456. 1928.]

Extensive laboratory and orchard spraying tests indicate that nicotine as an ovicide will partly control the oriental fruit moth.

DRIGGERS, B. F. (1731)

1929. ORIENTAL PEACH MOTH INVESTIGATIONS. N. J. Agr. Expt. Sta. Rept. 1927-28, pp. 145-154. [Abstract in Rev. Appl. Ent. (A) 17: 669-670. 1929.]

Nicotine sulphate alone was much more effective in killing eggs of the oriental peach moth (Grapholitha molesta Busck) in the black spot stage and newly hatched larvae than with the addition of resin fish-oil soap. Of the dusts, one containing 1 percent nicotine was best. A count of infested twigs showed an average of 3 and 3.4 percent injured twigs on trees sprayed with Volck and nicotine sulphate respectively. Against the third generation eggs and larvae, neither Volck, ground tobacco dust, nor nicotine sulphate was sufficiently successful to warrant more extensive tests.

GARMAN, P. (1732)

1929. THE ORIENTAL PEACH MOTH. Conn. Agr. Expt. Sta. Bull. 305, pp. 731-734, illus. [Abstract in Rev. Appl. Ent. (A) 17: 610. 1929.]

One percent white oil emulsions combined with various contact poisons were more effective than nicotine-soap combinations.

HAEUSSLER, G. J. (1733)

1929. THE ORIENTAL PEACH MOTH. Peninsula Hort. Soc. [Del.] Trans. 1929, pp. 80-86. [Abstract in Rev. Appl. Ent. (A) 17: 388-389. 1929.]

Nicotine or white oil emulsions will kill numbers of eggs or newly hatched larvae of the oriental peach moth (Grapholitha molesta Busck). The nicotine may be incorporated into the regular spray schedule for peaches, but for the later varieties one or two additional applications are necessary.

STEARNS, L. A. (1734)

1929. THE ORIENTAL FRUIT MOTH. Ill. Hort. Soc. Trans. 1928, 62: 111-122. [Abstract in Rev. Appl. Ent. (A) 17: 388. 1929.]

Nicotine is considered a negligible factor in the results obtained. Part of an orchard was sprayed five times with 40-percent nicotine sulphate (1:800) and hydrated lime (at rates varying from 60 to 100 lb. to 200 gal.) and once with the lime alone, at intervals of about 10 days from May 1 to June 27, 1928.

STEARNS, L. A., and NEISWANDER, R. B. (1735)

1929. HYDRATED LIME IN SUMMER SPRAYS FOR THE CONTROL OF THE ORIENTAL FRUIT MOTH. Jour. Econ. Ent. 22: 657-660, illus. [Abstract in Rev. Appl. Ent. (A) 17: 723. 1929.]

A spray of hydrated lime and 40-percent nicotine sulphate was unsatisfactory because this combination resulted in the nicotine being freed too soon. The addition of various insecticides to the lime spray increased its efficiency; 58 percent reduction in twig injury was obtained with the addition of 10 lb. tobacco fish-oil soap, and 77 percent reduction with Volck (2 percent) and 40-percent nicotine sulphate (1 to 800).

BALACHOWSKY, A. (1736)

1930. THE ORIENTAL PEACH MOTH (LASPEYRESIA MOLESTA BUSCK) IN THE SOUTH OF FRANCE. ECONOMIC IMPORTANCE AND MEASURES OF PROTECTION. Compt. Rend. Acad. Agr. France 16 (25): 848-854. [In French. Abstract in Rev. Appl. Ent. (A) 19: 85-86. 1931.]

No reduction in infestation was observed in orchards regularly sprayed with nicotine against aphids.

DRIGGERS, B. F. (1737)

1930. RECENT EXPERIMENTS ON ORIENTAL PEACH MOTH CONTROL IN NEW JERSEY. Jour. Econ. Ent. 23: 209-215. [Abstract in Rev. Appl. Ent. (A) 18: 406. 1930.]

Nicotine sulphate and white oil emulsions failed to secure complete control against the first brood eggs of (Laspeyresia) Grapholitha molesta Busck. Fruit counts in an orchard sprayed with nicotine sulphate showed about 21 percent of the fruit injured.

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1930. ORIENTAL PEACH MOTH. N. J. Agr. Expt. Sta. Rept. 1928-29, pp. 150-167. [Abstract in Rev. Appl. Ent. (A) 19: 168-169. 1931.]

In tests in which oil emulsions were impregnated with other chemicals, the best results against both the larvae and eggs were obtained when nicotine oleate (10 g. to 100 cc. oil) was used in sprays containing 0.5 percent and 1.0 percent actual oil, the total percentage of both larvae and eggs killed by these two sprays being 82.0 and 88.8 respectively.

GARMAN, P. (1739)

1930. THE ORIENTAL PEACH MOTH IN CONNECTICUT. Conn. Agr. Expt. Sta. Bull. 313, pp. 401-451, illus. [Abstract in Rev. Appl. Ent. (A) 18: 542-543. 1930.]

Nicotine sprays or dusts reduce infestation to some extent but not enough to warrant their employment.

------- (1740)

1930. ORIENTAL PEACH MOTH CONTROL STUDIES IN 1929. Jour. Econ. Ent. 23: 203-205. [Abstract in Chem. Abs. 24: 3313. 1930.]

In field tests against (_Laspeyresia_) _Grapholitha molesta_, emulsions of white petroleum oils containing nicotine sulphate gave slight reduction in percentage of infested fruit. Laboratory tests on the eggs showed high toxicity for white oil emulsion containing nicotine sulphate.

4. Leaf Miners and Casebearers, 1911-1933

HARUKAWA, C., and KUMASHIRO, S. (1741)

1932. ON THE PEAR-BARK MINER, ACROCERCOPS ASTAUROTA MEYRICK. II. Ber. Ōhara Inst. Landw. Forsch. 5 (2); 301-310. [Abstract in Rev. Appl. Ent. (A) 20: 476-477. 1932.]

A spray consisting of nicotine sulphate (1:1,000) and 3 lb. of soap per 100 gal. is recommended as an ovicide. In the tests this spray destroyed all the eggs of this tineid moth.

VAN ZWALUWENBURG, R. H. (1742)

1917. INSECTS AFFECTING COFFEE IN PORTO RICO. Jour. Econ. Ent. 10: 513-517. [Abstract in Rev. Appl. Ent. (A) 6: 103-105. 1918.]

Nicotine sulphate sprays are partially effective against the larvae of the coffee leaf miner (_Leucoptera coffeella_ Staint.), but they fail to kill the eggs of the moths.

WOLCOTT, G. N. (1743)

1921. THE COFFEE LEAF MINER, LEUCOPTERA COFFEELLA STAIN. Porto Rico Insular Expt. Sta., Circ. 52, 12 pp., illus. [In Spanish. Abstract in Rev. Appl. Ent. (A) 10: 535. 1922.]

In Cuba an oil emulsion has been used against the larvae and pupae of the above insect, and also a less costly nicotine spray, such as Black Leaf 40.

BRUNER, S. C. (1744)

1929. SURVEY OF THE PESTS OF COFFEE IN CUBA. Cuba Estac. Expt. Agron. Circ. No. 68, 38 pp. [Abstract in Rev. Appl. Ent. (A) 17: 732. 1929.]

If necessary the pupae of the tineid leaf miner Leucoptera coffeella Guer. can be destroyed by a nicotine spray.

CROSBY, C. R. (1745)

1911. THE PLUM LEAF MINER. N. Y. (Cornell) Agr. Expt. Sta. Bull. 308, pp. 219-227, illus.

The eggs of this moth (Nepticula slingerlandella Kearfott) were sprayed with Nico-fume (1 oz. in 5 gal. soap solution), but the spraying did practically no good. The larvae of the elm sawfly leaf miner (Kaliosysphinga ulmi Sundeval) while in their mines can be killed with a nicotine and soap solution, but less than 10 percent of the larvae of the plum leaf miner were killed with "Black Leaf 40" (1 to 800 of soap solution).

MITRA, S. K., and KHONGWIR, P. C. (1746)

1928. ORANGE CULTIVATION IN ASSAM. Dept. Agr. Assam Bull. No. 2, 19 pp. [Abstract in Rev. Appl. Ent. (A) 17: 602. 1929.]

In the case of severe infestation by the leaf miner Phyllocnistis citrella Stn. spraying with a mixture of crude oil emulsion and tobacco decoction is recommended.

O'KANE, W. C., and WEIGEL, C. A. (1747)

1921. EXPERIMENTS WITH CONTACT SPRAYS FOR LEAF MINERS. N. H. Agr. Expt. Sta. Tech. Bull. 17, 24 pp., illus. [Abstract in Rev. Appl. Ent. (A) 10: 76. 1922.]

None of the sprays used was very successful against mature larvae of Tischeria malifoliella (apple-leaf trumpet miner). Young larvae of the second generation were destroyed by sprays of Nico-fume or Black Leaf 40 at 1 to 100 or 1 to 200, the mortality ranging from 73 to 37 percent. Sprays applied for the first generation gave definite residual effects on the eggs of the second generation laid 2 or 3 weeks later, the mortality on foliage sprayed with nicotine diluted 1 to 100 or 1 to 200 ranging from 93 to 70 percent as compared with a normal mortality of 22 percent.

ANONYMOUS (1748)

1924. ENTOMOLOGY. Iowa Agr. Expt. Sta. Ann. Rept. 1923-1924, pp. 42-46. [Abstract in Rev. Appl. Ent. (A) 13: 505. 1925.]

For the control of the apple trumpet leaf miner (*Tischeria malifoliella*) 1 pt. of nicotine sulphate in 100 gal. of soapy water should be applied in July when most of the second generation moths are flying and ovipositing on the leaves. Melon aphids (*Aphis gossypii*)can be controlled by nicotine dust containing 2 percent free nicotine.

MARLATT, C. L. (1749)

1933. REPORT OF THE CHIEF OF THE BUREAU OF ENTOMOLOGY, 1933. U. S. Dept. Agr., 47 pp. [Abstract in Rev. Appl. Ent. (A) 22: 354-356. 1934

Nicotine sulphate at 1 to 1,000 gave 19 percent control of the pecan nut casebearer (*Acrobasis caryae* Grote) when used with bordeaux mixture (3:4:50); 91, 92, and 94 percent control with 3 different white-oil emulsions at strengths of 0.75 percent; and 90 percent control with fish oil at 0.25 percent (p. 355).

WARBURTON, C. (1750)

1921. ANNUAL REPORT FOR 1921 OF THE ZOOLOGIST. Jour. Roy. Agr. Soc., England 82: 270-275. [Abstract in Rev. Appl. Ent. (A) 10: 366-367. 1922.]

Against *Coleophora nigricella* winter washes are useless, but nicotine washes at the time of attack are highly effective.

THEOBALD, F. V. (1751)

1922. ENTOMOLOGICAL DEPARTMENT. So. East. Col. Wye, Res. and Advisory Dept. Ann. Rept.,pp, 10-13. [Abstract in Rev. Appl. Ent. (A) 10: 336. 1922.]

A comparison of pure nicotine wash and nicotine sulphate has shown the latter to be quite as effective, to have more lasting powers when mixed with soft soap, and to be much cheaper. Nicotine wash destroyed 85 percent of the apple and plum casebearer (*Coleophora nigricella*) and nicotine sulphate with soap destroyed 92 percent.

------- (1752)

1922. THE APPLE AND PLUM CASE BEARER (*COLEOPHORA NIGRICELLA*, STGCH.) AND ITS TREATMENT. Jour. Pomol. and Hort. Sci., reprint, 7 pp., illus. [Abstract in Rev. Appl. Ent. (A) 11: 77-78. 1923.]

Tests with lead arsenate and calcium arsenate in the spring were ineffective; but 1 oz. 96-percent nicotine, 1/2 lb. soft soap and 10 gal. water killed over 80 percent of the larvae, and 1 oz. nicotine sulphate, 1/2 lb. soft soap and 10 gal. water, over 90 percent. The latter took 48 hours longer to have the same effect as the former, but the effect on some aphids was greater. It is essential to mix nicotine sulphate with soft soap.

FRYER, J. C. F., ET AL. (1753)

1923. REPORT ON THE OCCURRENCE OF INSECT PESTS OF CROPS IN ENGLAND AND WALES FOR THE YEARS 1920-1921. Min. Agr. and Fisheries Misc. Publ. 39, 40 pp. [Abstract in Rev. Appl. Ent. (A) 11: 468-469. 1923.]

The casebearers Coleophora nigricella and C. anatipenella were satisfactorily controlled by nicotine (or nicotine sulphate) and soap.

HUTSON, R. (1754)

1932. THE CONTROL OF THE CHERRY CASE BEARER (COLEOPHORA PRUNIELLA) BY DORMANT AND OTHER SPRAYS. Jour. Econ. Ent. 25 (1): 116-120. [Abstract in Rev. Appl. Ent. (A) 20: 293. 1932.]

A satisfactory degree of control was secured by the application of nicotine sulphate or derrisol, each in combination with lime-sulphur applied early in May. This type of spray is recommended as an emergency measure, if dormant sprays have not been applied.

VOLCK, W. H. (1755)

1917. THE APPLE LEAF-MINING CASE-BEARER (COLEOPHORA VOLCKEI). Calif. State Comm. Hort. Monthly Bull. 6 (11-12): 463-467, illus. [Abstract in Rev. Appl. Ent. (A) 6: 99-100. 1918.]

Contact insecticides were tried early in the spring when the caterpillars were leaving hibernation. Trees were sprayed with 3 lb. nicotine sulphate to 8 lb. flour (worked into a paste) and 12 lb. milled sulphur, made up with 200 gal. water. After a second application, a great reduction in number of the casebearers was noted, but a table shows that the control of the codling moth and fruit-tree leaf roller (Cacoecia argyrospila) is not so effective by this means as with arsenicals.

MARGABANDHU, V. (1756)

1933. INSECT PESTS OF ORANGES IN THE NORTHERN CIRCARS. Madras Agr. Jour. 21 (2): 60-68, illus. [Abstract in Rev. Appl. Ent. (A) 21: 502. 1933.]

The best method controlling the tineid moth Phyllocnistis citrella Stu. (citrus leaf miner) is copious irrigation and drenching the seedlings with tobacco decoction (1 lb. to 5-6 gal. water) at intervals of 10 days or less.

5. Fruit-Tree Borers and Budmoths, 1813-1932

BROOKS, F. E. (1757)

1920. PEAR BORER. U. S. Dept. Agr. Bull. 887, 8 pp., illus. [Abstract in Rev. Appl. Ent. (A) 9: 201-202. 1921.]

Nicotine sulphate sprays are less effective than kerosene emulsion which kills about 85 percent of the borers (*Aegeria pyri* Harris

DURUZ, W. P. (1758)

1922. THE PEACH TWIG-BORER AND ITS CONTROL. Calif. Dept. Agr. Monthly Bull. 11 (1): 58-62, illus. [Abstract in Rev. Appl. Ent. (A) 10: 249-250. 1922.]

Exceptionally good results against *Anarsia lineatella* Z. were obtained with nicotine sulphate and zinc arsenite.

------- (1759)

1923. THE PEACH TWIG BORER (*ANARSIA LINEATELLA* ZELLER). Calif. Agr. Expt. Sta. Bull. 355, pp. 419-464, illus. [Abstract in Rev. Appl. Ent. (A) 11: 284-285. 1923.]

Good control was obtained with lime-sulphur solution, nicotine sulphate, and arsenicals (during blooming), but oil sprays were ineffective.

FAURE, J. C., and ALABOUVETTE, L. (1760)

1924. NOTE SUR L'*ANARSIA LINEATELLA* ZELL. ET SES PARASITES DANS LA REGION DE LYON EN 1924. Rev. Zool. Agr. et Appl. 23 (12): 279-287, illus. [Abstract in Rev. Appl. Ent. (A) 13: 156. 1925.]

In France, copper sulphate sprays with the addition of 1 1/2 lb. of pure nicotine or 10 lb. commercial triplumbic arsenate per 100 gal. of spray have given great success when applied from the time the buds open. One treatment was found to be sufficient.

SLINGERLAND, M. V. (1761)

[1813.] THE PEACH-TREE BORER. N. Y. (Cornell) Agr. Expt. Sta. Bull. 176, pp. 157-233, illus. 1899.

A brief review of the literature on this insect (*Sanninoidea exitiosa* Say) shows that tobacco was used in 1813, 1839, and 1894-1896. The author put tobacco stems, as usual, around the base of peach trees and obtained variable results. Tobacco kept out from 2/3 to 5/6 of the borers during 1895 and 1896, which is decidedly a good showing for the method (p. 196-197).

ADAMS, C. F. (1762)

1907. SOME INSECTS OF ORCHARD AND OTHER FRUITS. Ark. Agr. Expt. Sta. Bull. 92, 17 pp., illus.

To get at the woolly aphids (*Schizoneura lanigera*) on the roots of apple trees the earth must be removed from about the tree for a space of 2 ft., then 6 lb. of tobacco dust or 12 lb. tobacco stems should be put in and covered well with earth (p. 10). A similar method of using tobacco stems as a preventive against the peach borer (Sanninoidea exitiosa) is also described (p. 14).

CORY, E. N. (1763)

1913. THE PEACH-TREE BORER. Md. Agr. Expt. Sta. Bull. 176, pp. 181-218, illus.

Tobacco dust put at bases of trees and the earth mounded to a height of 6 inches gave immunity for the fruit year, but on trial the second year failed to keep out the worms of the moth Sanninoidea exitiosa Say (pp. 199-203).

BECKER, G. G. (1764)

1918. THE PEACH-TREE BORER, SANNINOIDEA EXITIOSA SAY. Ark. Agr. Expt. Sta. Bull. 150, 32 pp. [Abstract in Rev. Appl. Ent. (A) 6: 448. 1918.]

Nicotine preparations at different dilutions were ineffective.

PETERSON, A. (1765)

1918. SOME EXPERIMENTS ON THE ADULTS AND EGGS OF THE PEACH TREE BORER, SANNINOIDEA EXITIOSA SAY, AND OTHER NOTES. Jour. Econ. Ent. 11: 46-55, illus. [Abstract in Rev. Appl. Ent. (A) 6: 196-197. 1918.]

Nicotine resinate was not effective in preventing oviposition on peach branches by Aegeria (Sanninoidea) exitiosa.

PETERSON, A. (1766)

1919. PEACH TREE BORER. N. J. Agr. Expt. Sta. Rept. 1917-1918, pp. 234-243. [Abstract in Rev. Appl. Ent. (A) 9: 524. 1921.]

Sprays of nicotine resinate, Scabecide, and other insecticides were applied at intervals of 10 days to 2 weeks. In all cases the trees were uninjured but the number of larvae of the peach tree borer (Aegeria (Sanninoidea) exitiosa Say) was not materially reduced.

PETERSON, A. (1767)

1923. THE PEACH TREE BORER IN NEW JERSEY. N. J. Agr. Expt. Sta. Bull. 391, 143 pp., illus.

Nicotine resinate, used as a stomach poison, was applied as a spray (1:100) to the trunks of many peach trees. It disappears slowly. Definite tests for nicotine showed it present as long as 5 weeks after an application was made. This test indicates the ineffectiveness of nicotine resinate as a stomach poison for newly hatched peach tree borers (Sanninoidea exitiosa Say) (p. 33). Nicotine resinate was also used as an ovicide, and as a larvicide for newly hatched larvae. It was not considered promising for these purposes (pp. 31-32).

LATHROP, F. H., and BLACK, A. B. (1768)

1921. STUDIES OF *SANNINOIDEA OPALESCENS* EDW. IN OREGON. Jour. Econ. Ent. 14: 328-336.

These studies deal with the moth, called the western peach and prune root borer. The soil was removed from the bases of fruit trees and 40-percent nicotine sulphate, nicotine oleate, nicotine resinate, or tobacco dust were applied and the top soil was replaced. In no case was there a satisfactory control, and these substances do not seem promising (p. 331). Nicotine sulphate was also used in tree washes containing 5 or 6 different substances, and it may have had some value (pp. 333, 335).

---------- and BLACK, A. B. (1769)

1921. THE WESTERN PEACH AND PRUNE ROOT BORER (*SANNINOIDEA OPALESCENS* EDW.). Ore. Agr. Expt. Sta. 3rd Crop Pest and Hort. Rept. 1915-20, pp. 59-70, illus. [Abstract in Rev. Appl. Ent. (A) 9: 163. 1921.]

Whitewash treatments have been found beneficial, a successful formula being 8 lb. quicklime, 1/4 lb. lead arsenate powder, 2 lb. salt 1/4 lb. glue, 2 oz. 40-percent nicotine sulphate, and enough water to make into a thick paint.

SANDERS, G. E., and DUSTAN, A. G. (1770)

1919. THE APPLE BUD MOTHS AND THEIR CONTROL IN NOVA SCOTIA. Canada Dept. Agr. Ent. Branch Bull. 16, 39 pp., illus. [Abstract in Rev. Appl. Ent. (A) 7: 309-310. 1919.]

A spray consisting of 2 lb. soluble sulphur, 1 pt. nicotine sulphate, 4 lb. fish-oil soap, and 100 gal. water, applied as a drenching spray immediately before the blossoms opened, gave almost perfect contro of budmoths, canker-worms, fruitworms, and many other lepidopterous larvae.

KELSALL, A. (1771)

1927. RECENT EXPERIMENTS ON BUDMOTH CONTROL. Canad. Hort. Fruit and Truck Ed. 50 (2): 28. [Abstract in Rev. Appl. Ent. (A) 15: 344. 1927.

Nicotine (1:400 or 1:800) was the only insecticide effective in a apple orchard heavily infested with budmoths particularly the eye-spotte budmoth (*Eucosma ocellana* Schiff.). The use of a spreader did not increase its effectiveness.

KELSALL, A., and HERMAN, F. A. (1772)

1928. THE PERSISTENCE OF A POISONOUS RESIDUE ON FOLIAGE SPRAYED WITH NICOTINE SULPHATE. Sci. Agr. 8 (7): 465-466. [Abstract in Rev. Appl. Ent. (A) 16: 330-331. 1928.]

Nicotine sulphate (1:400) applied to the lower surface of apple leaves to control Eucosma (Spilonota) ocellana Schiff. did not prevent oviposition and hatching, but the larvae died shortly afterwards. The same has been found to hold good whether nicotine sulphate is used alone or in combination with casein lime, hydrated lime, bordeaux mixture or lime-sulphur. Analyses show that the nicotine on the leaves a few days after spraying was about 5 percent of that originally applied.

PARROTT, P. J., and HARMAN, S. W. (1773)

1929. THE BUD MOTH. N. Y. Agr. Expt. Sta. Circ. 109, 10 pp., illus. [Abstract in Rev. Appl. Ent. (A) 17: 270. 1929.]

For the control of the budmoth, Eucosma (Spilonota) ocellana Schiff. the standard spray program is recommended. The formula for the delayed dormant application is 2 1/2 gal. lime sulphur, 2 1/2 - 3 lb. lead arsenate, 1 pt. nicotine sulphate (40-percent) and 100 gal. water. If supplementary treatments are required for heavy infestations nicotine sulphate at the rate of 1 qt. to 100 gal. lime-sulphur (1:40) may be applied just before the larvae leave their winter shelters. Nicotine sulphate at the rate of 1 pt. to 100 gal. spray may be used against the newly hatched larvae.

HARMAN, S. W. (1774)

1931. CONTROL OF HIBERNATING CATERPILLARS OF THE EYE-SPOTTED BUDMOTH IN APPLE ORCHARDS. N. Y. (Geneva) Agr. Expt. Sta. Bull. 600, 18 pp., illus. [Abstract in Rev. Appl. Ent. (A) 20: 219. 1932.]

A combination of an oil spray with nicotine sulphate appeared to be promising against Eucosma (Spilonota) ocellana Schiff. Nicotine sulphate in lime-sulphur caused almost as marked a reduction in the number of larvae. In normal seasons, the delayed dormant spray of nicotine sulphate generally applied against the rosy aphid (Anuraphis roseus Baker) may prove valuable in reducing injury by E. ocellana.

—————— (1775)

1932. SUMMER TREATMENTS FOR THE CONTROL OF THE EYE-SPOTTED BUDMOTH. N. Y. (Geneva) Agr. Expt. Sta. Bull. 609, 16 pp., illus. [Abstract in Rev. Appl. Ent. (A) 20: 467. 1932.]

Sprays of 3 lb. lead arsenate or 1 pt. nicotine sulphate in 100 gal., or a combination of both materials, will reduce the damage caused by Eucosma (Spilonota) ocellana Schiff. The moths also proved susceptible to 2 percent nicotine dusts, but the practical value of these methods was not determined.

SCOTT, E. W., and PAINE, J. H. (1776)

1914. THE LESSER BUDMOTH. U. S. Dept. Agr. Bull. 113, 16 pp., illus.

A spray of Black Leaf 40 (1:800) gave no noticeable results (p.13) against Recurvaria nanella Hübner.

MOKRZECKI, S. A. (1777)

1913. HYPONOMEUTA MALINELLUS ZELL.: ITS BIONOMICS AND METHODS OF FIGHTING IT. Simferopol, illus. [In Russian. Abstract in Rev. Appl. Ent. (A) 1: 345-349. 1913.]

This insect is found everywhere in Russia on apple trees. The author doubts the effectiveness of tobacco extract as now used in the Crimea (containing 3.7 percent nicotine and applied in a 2.6 percent solution in water) to destroy these caterpillars, except in the earliest stage. He describes his tests with the caterpillars in the mining stage, which he sprayed with a 1 percent solution of tobacco extract, and with a 1/2 percent solution of kerosene emulsion. After 24 hours the caterpillars sprayed with tobacco and kerosene were dead.

WAHL, C. VON (1778)

1916. HYPONOMEUTA MALINELLUS UND H. VARIABILIS. HAUPTSTELLE FÜR PFLANZENSCHUTZ IN BODEN AN DER GROSSH. LANDW. Versuchanstalt Augustenberg, Flugblatt No. 5. [Abstract in Rev. Appl. Ent. (A) 8: 288. 1920.

Remedial measures against the caterpillars are spraying with soft-soap solutions containing nicotine or quassia.

STEFANI, T. DE (1779)

1922. ON SOME INJURIOUS INSECTS. Rinnovamento Econ.-Agrar. 16 (5-6): 65-69; 92-95. [In Italian. Abstract in Rev. Appl. Ent. (A) 10: 444. 1922.]

It is suggested that a nicotine spray applied as soon as the larvae of *Hyponomeuta malinellus* Z. hatch will prevent any serious injury to apples.

FAES, H. (1780)

1928. LA LUTTE CONTRE LES CHENILLES FILEUSES OU CHENILLES D'HYPONOMEUTES. Ann. Agr. Suisse 29 (5): 520-533, illus. [Abstract in Rev. Appl. Ent. (A) 17: 258-259. 1929.]

The only spray that gave complete satisfaction in tests against young larvae of *Hyponomeuta malinellus* Zell. while still under the shelter of the eggs was a kerosene emulsion prepared by dissolving 1/2 lb. soft soap in 1 gal. of hot water and adding while still hot 5 pt. kerosene, agitating it to an emulsion, pouring into a solution of 2 lb. caustic soda (98 percent sodium hydroxide) dissolved in 9 gal. soft water, and mixing the whole. Its efficacy may be still further increased by adding 15-percent nicotine (1:100).

ARKHANGEL'SKII, P. (1781)

1930. ON THE EFFECT OF TOBACCO. Plant Protect. 6(5-6): 777-778, Leningrad. [In Russian. Abstract in Rev. Appl. Ent. (A) 19: 47. 1931.]

In the laboratory all larvae of the apple moth Hyponomeuta padellus L. (malinellus Zell.) fed on leaves sprayed with tobacco decoction died within 9 days, unless they were about to pupate. Spraying an infested tree with a decoction of 1 lb. of tobacco dust in 3 gal. of water did not affect the larvae while they remained in the mines in the leaves, but killed 81.2 percent shortly after they came to the surface and began feeding on the sprayed foliage; after a fortnight all had apparently been killed, as no nests were formed on the tree. From these tests, the author concludes that nicotine acts as a stomach poison as well as a contact insecticide.

BATIASHVILI, I. D. (1782)

1931. COMPARATIVE TESTS OF INSECTICIDES ON THE CATERPILLAR OF HYPONOMEUTA MALINELLUS ZELL. Bull. Sci. Res. Inst. U.S.S.R. Tree and Small Fruit Cult., Sec. Plant Prot. (Ent.), No. 3,39 pp., illus. [Kiev]. [In Russian. Abstract in Rev. Appl. Ent. (A) 19: 504. 1931.]

Sprays of 1 per mille nicotine sulphate and 5 per mille soft soap killed 85.8 percent of the larvae, the mortality increasing to 95.9 percent when double the amount of soap was used. Nicotine and soap in the same concentrations killed 96.9 and 98.2 percent respectively. These were tests against the third instar larvae. Sprays consisting of 1 per mille nicotine sulphate and 10 per mille soap killed 89.3 percent of the fourth-instar larvae.

FEYTAUD, J. (1783)

1928. LES CHENILLES DU PRUNIER. LA CHENILLE FILEUSE. Rev. Zool. Agr. et Appl. 27 (4): 53-58, illus. [Abstract in Rev. Appl. Ent. (A) 16: 623-624. 1928.]

Of various sprays, nicotine, either alone or with alcohol or in bordeaux mixture, gave the best results against Hyponomeuta padellus L. While other formulae had greater powers of wetting and penetrating the nests a bordeaux and nicotine spray besides possessing distinctly toxic properties gave surer results, while casein or ox-gall is a good spreader.

BATIASHVILI, I. (1784)

1933. RESULTS OF TESTS OF CERTAIN CHEMICAL PREPARATIONS FOR THE CONTROL OF GNAWING PESTS OF ORCHARDS. Demy 8vo, 21 pp. (133-153), Tiflis (Inst. Pflsch. S.S.R. Georg.). [In Georgian with summaries in Russian and German. Abstract in Rev. Appl. Ent. (A) 22: 336-337. 1934.]

Against Nygmia phaeorrhoea Don. and Hyponomeuta padellus malinellus Zell., the most satisfactory results were obtained with nicotine sprays with the addition of soap, which sometimes killed all larvae of the latter species. Arsenicals had practically no effect on the former species.

D'ANCONA, U., and NANNIZZI, A. (1785)

1934. BIOLOGICAL OBSERVATIONS ON HYPONOMEUTA PADELLUS L. Riv. Biol. 16 (1): 47-60, illus. [In Italian. Abstract in Rev. Appl. Ent. (A) 22: 330. 1934.]

These moths were controlled by spraying with lead arsenate and a nicotine insecticide.

TROUVELOT, B., and WILLAUME, F. (1786)

1925. ON A NEW PRINCIPLE OF ATOMIZING BY USE OF HEAT AS A DYNAMIC AND ACTIVATING FORCE. (TEPID SPRAYS SUPER-WET). Rev. Path. Veg. et Ent. Agr. 12 (1): 44-55, illus. [In French. Abstract in Rev. Appl. Ent. (A) 13: 489-490. 1925.]

Using a new principle of heating the spray up to 212° F. as it passed through the nozzle, Hyponomeuta spp. were destroyed in their nests, using nicotine soap sprays, no damage being done to the foliage. The aphids (Aphis rumicis on Euonymus and Myzus cerasi on wild cherry) were destroyed by the same spray, though the leaves were curled.

7. Olive Moths, 1903-1929

WATIÈRES, G. F. (1787)

1921. THE OLIVE TREE. Rev. Agr. Afr. Nord., Algiers 19 (114): 752-755. [In French. Abstract in Rev. Appl. Ent. (A) 10: 33. 1922.]

The moth Margarodes unionalis chiefly attacks young trees and grafts. As these are always trees without much leaf surface, nicotine sprays are recommended as being as efficacious and not so dangerous as lead arsenate.

GUERCIO, G. DEL (1788)

1903. NOTES AND PRACTICAL SUGGESTIONS FOR THE KNOWLEDGE AND CONTROL OF ANIMALS INJURIOUS TO CULTIVATED PLANTS AND THEIR FRUITS. Nuove Relaz R. Staz. Ent. Agr., Florence 1st Ser., No. 5, 208 pp., illus. [In Italian.]

As a control for the moth Prays oleellus Fabr. on olive trees in Italy, plain soap solution may be modified to better advantage by using 2 percent soap and 1 percent naphthalene in 100 l. of water, or a 3 percent nicotine soap solution (p. 72).

Against the moth Hyponomeuta malinellus Zeller on apple trees a spray consisting of 1 to 1.5 percent of neutralized tobacco extract with 2 percent soft soap is used (p. 76).

CHAPELLE, J. (1789)

1908. LA CHENILLE MINEUSE OU TEIGNE DE L'OLIVIER. Bull. Mensuel Soc. Cent. Agr., Hort. et Acclim. [Nice] 48 (4): 106-111.

Against the olive leaf miner Tinea oleaella or Prays oleae, Dollonne found the following spray mixture satisfactory: 1 to 2 kg. copper sulphate, 4 to 6 kg. lime, 1 l. concentrated nicotine or 2 to 3 l. tobacco juice. Dumont recommends the following: 1 kg. black soap, 500 g. sodium carbonate, 1 l. concentrated nicotine, and 100 l. water (pp. 110-111).

----------, and RUBY, J. (1790)

1908. LA TEIGNE OU CHENILLE MINEUSE DE L'OLIVIER. Prog. Agr. et Vitic. 50: 22-26.

Against the larvae of a moth (Tinea oleaella or Prays oleae) on olive trees in South France the following spray mixture is recommended: 1 l. titrated nicotine, 500 g. sodium carbonate, 1 kg. black soap, and 100 l. water (p. 26).

----------, and RUBY, J. (1791)

1912. LUTTE CONTRE LA CHENILLE MINEUSE DE L'OLIVIER. Bull. Soc. Etude et Vulg. Zool. Agr. 11 (2): 59-60.

Against the olive miner on olive trees the nicotine-bordeaux combination has been shown to be far superior to lead arsenate under the same conditions.

RIBA FERRE, J. (1792)

1920. THE OLIVE. Consell Prov. de Foment [Barcelona] 98 pp., illus. [In Spanish. Abstract in Rev. Appl. Ent. (A) 9: 278. 1921.]

The moth Prays oleellus may be combated by spraying with arsenicals, lysol, tobacco extract 12° Bé., or nicotine of 93-94 percent purity.

GABOTTO, L. (1793)

1929. INSECTS INJURIOUS TO THE PRINCIPAL CULTIVATED WOODY PLANTS. Biblioteca Agr. "Paravia", 100 pp., illus. [In Italian]

A 2 percent solution of phenicated tobacco extract is recommended in Italy against the following moths: Simaethis nemorana on figs, Prays oleaellus on olive trees, Prays citri on citrus trees, and Hyponomeuta malinellus on apple trees (pp. 60-62).

8. Leaf Rollers, 1912-1933

GILLETTE, C. P., and WELDON, G. P. (1794)

1912. THE FRUIT-TREE LEAF-ROLLER IN COLORADO. Col. State Ent. Circ. 5, 44 pp., illus.

Black Leaf 40, carefully and thoroughly applied about the same dates as the first two sprayings with arsenicals, will give good results against this moth (Archips argyrospila Walk.).

A mixed spray of Black Leaf 40 and lead arsenate is little more satisfactory than either one of the insecticides used alone. Furthermore, the cost of such a spray would be too great for practical purposes (p. 42).

GILL, J. B. (1795)

1913. THE FRUIT-TREE LEAF-ROLLER (ARCHIPS ARGYROSPILA WALK.). U. S. Dept. Agr. Bur. Ent. Bull. 116, Pt. V, pp. 91-117, illus.

Applications of arsenicals alone and in combination with 40-percent nicotine solution have greatly reduced the amount of injury to apples and foliage, but these sprays have not been so effective as is desirable against this moth in Colorado (p. 108).

GILLETTE, C. P., and WELDON, G. P. (1796)

1913. THE FRUIT TREE LEAF-ROLLER IN COLORADO. Colo, State Ent. 4th Ann. Rept. Circ. 7, pp. 30-67, illus. [Abstract in Rev. Appl. Ent. (A) 2: 14-15. 1914.]

In insectary tests to control Archips argyrospila Walk., Black Leaf 40, Nicofume, and other tobacco preparations used alone or with soap were of no value. From orchard experiments it was concluded that Black Leaf 40, carefully and thoroughly applied about the same dates as the first two sprayings with arsenicals will give good results. A mixed spray of Black Leaf 40 and lead arsenate is little more satisfactory than either one of the insecticides used alone; furthermore the cost of such spray would be too great for practical purposes.

WELDON, G. P. (1797)

1913. THE FRUIT-TREE LEAF-ROLLER. Calif. State Comn. Hort. Monthly Bull. 2 (9): 637-647, illus. [Abstract in Rev. Appl. Ent. (A) 1: 425-426. 1913.]

Thorough drenching with 3 lb. lead arsenate to 50 gal. water, or with Black Leaf 40 (1:800) will kill the young larvae of the moth Archips argyrospila Walk. just after the leaves come out in the spring.

KELSALL, A., and PATTERSON, N. A. (1798)

1931. EXPERIMENTS ON THE CONTROL OF THE GRAY-BANDED LEAF ROLLER, EULIA MARIANA FERN. Ontario Ent. Soc. 61st Ann. Rept. 1930, pp. 84-85.

In experiments 48.9 percent control was obtained with 1 application of lead arsenate (1 lb. to 40 gal.water), 75.3 percent with 2 applications of the same spray, and 84.8 percent with 2 applications of 40-percent nicotine sulphate (1:800).

CORDLEY, A. B., and JARDINE, J. T. (1799)

1921. DEPARTMENT OF ENTOMOLOGY. Ore. Agr. Expt. Sta. Rept. 1918-1920. pp. 59-63. [Abstract in Rev. Appl. Ent. (A) 9: 222-223. 1921.]

The ravages of the apple leaf roller (Tortrix argyrospila) and T. rosaceana may be reduced by from 50 to 90 percent by means of oil sprays in April. Calyx sprays of oil, lead arsenate, and Black Leaf 40 killed about 33 percent of the young larvae.

SPULER, A. (1800)

1922. THE ORCHARD LEAF-ROLLER. Wash. Agr. Expt. Sta. Bull. 179, 9 pp. [Abstract in Rev. Appl. Ent. (A) 11: 448. 1923.]

Nicotine dust and liquid sprays of nicotine sulphate have given no practical control of Tortrix (Archips) argyrospila.

BELOSELSKAYA, Z. G. (1801)

1925. ON THE BIOLOGY OF SOME INJURIOUS LEAF-ROLLERS. Defense des Plantes 2 (4-5): 217-226. [In Russian. Abstract in Rev. Appl. Ent. (A) 14: 58-59. 1926.]

Fumigation with tobacco dust in the evening gave satisfactory results against the leaf-roller Tortrix (Cacoecia) rosana L.

HUTSON, R. (1802)

1933. THE CONTROL OF STRAWBERRY LEAF ROLLER ON BEARING PLANTS. Mich. State Quart. Bull. 16 (1): 7-8. [Abstract in Expt. Sta. Rec. 70: 64. 1934.]

A combination of nicotine sulphate 1 pt., summer oil emulsion 1 gal., and activated pyrethrum dust was found to be the most promising spray material. Most of the effect is due to killing of the eggs. It is necessary to use about 3 sprays at weekly intervals and from 85 to 90 percent control is thus obtained.

9. Cranberry Moths, 1890-1933

FRANKLIN, H. J. (1803)

1924. CRANBERRY INSECT INVESTIGATIONS. Cape Cod Cranberry Growers' Assoc. Ann. Rept. 36 (1923-24), pp. 4-7. [Abstract in Rev. Appl. Ent. (A) 14: 67. 1926.]

The yellow-head fireworm (Peronea minuta) and red-striped fireworm (Galechia trialbamaculella) can both be controlled by killing the moths early in April with a spray of 1 qt. nicotine sulphate and 4 lb. fish-oil soap in 100 gal. water. The moths of the cranberry girdler (Crambus hortuellus) can be destroyed by spraying with 20 lb. caustic fish-oil soap in 100 gal. water at the rate of 800 gal. per acre if the vines are thick. This spray is supplemented with two or three applications of nicotine sulphate and soap.

SMITH, J. B. (1804)

1890. THE INSECTS INJURIOUSLY AFFECTING CRANBERRIES. N. J. Agr. Expt. Sta. Spec. Bull. K, 43 pp., illus.

Tobacco is the favorite Cape Cod remedy, and is eminently successful against the black-headed cranberry worm (Rhopobota vacciniana). It was applied as a decoction, about 1.5 lb. to 1 gal. of water, and a gallon was made to cover a square rod (p. 22).

HOWARD, L. O. (1805)

1916. REPORT OF THE ENTOMOLOGIST FOR THE YEAR ENDED JUNE 30, 1916. U. S. Dept. Agr. Bur. Ent., 24 pp. [Abstract in Rev. Appl. Ent. (A) 5: 177-179. 1917.]

The so-called blackhead fire-worm (Rhopobota vacciniana) on cranberries may be controlled by spraying with 40-percent nicotine sulphate while the insects are in the larval stage.

FRANKLIN, H. J. (1806)

1917. REPORT OF THE CRANBERRY SUBSTATION FOR 1916. Mass. Agr. Expt. Sta. Bull. 180, pp. 183-234. [Abstract in Rev. Appl. Ent. (A) 6: 553- 554. 1918.]

Rhopobota vacciniana Pack. (black-head fireworm) was successfully controlled in the larval stage with Black Leaf 40, 1 part to 400 parts water, resin-fish oil soap being added at the rate of 2 lb. to 50 gal.

SCAMMEL, H. B. (1807)

1917. CRANBERRY INSECT PROBLEMS AND SUGGESTIONS FOR SOLVING THEM. U. S. Dept. Agr., Farmers' Bull. 860, 45 pp., illus. [Abstract in Rev. Appl. Ent. (A), 6: 561-564. 1918.]

On dry bogs two sprays should be given, using 40-percent nicotine sulphate (1:800) at the rate of 200 gals. per acre, to help control the fireworms of moths (Peronea minuta Rob. and Rhopobota vacciniana Pack.).

ANONYMOUS (1808)

1919. DIVISION OF ZOOLOGY AND ENTOMOLOGY. Wash. Agr. Expt. Sta. Ann. Rept. 28 (1917-1918). Bull. 153, pp. 34-38. [Abstract in Rev. Appl. Ent. (A) 9: 378-379. 1921.]

Nicotine gave better results than arsenicals against the blackhead fireworm (Rhopobota (Eudemis) vacciniana) on cranberries. A spreader, such as soap or glue, is necessary.

FRANKLIN, H. J. (1809)

1919. SEVENTH REPORT OF THE CRANBERRY SUBSTATION FROM 1917 to 1919. Mass. Agr. Expt. Sta. Bull. 192, pp. 105-141. [Abstract in Rev. Appl. Ent. (A) 9: 49-51. 1921.]

The nymphs of the froghopper (Clastoptera vittata Ball) can be controlled by spraying with one part of Black Leaf 40 to 400 parts of water with 2 lb. resin fish oil soap to 50 gal.; or 800 parts of water when the nymphs are very small. Sprays of Black Leaf 40 (1:400) killed gypsy moth caterpillars (Porthetria dispar L.) in their early stages but not when they were nearly full-grown. The same spray is effective against the black-headed fireworm (Rhopobota vacciniana Pack.) as well as the spittle insect.

HOWARD, L. O. (1810)

1919. REPORT OF THE ENTOMOLOGIST. U. S. Dept. Agr. Bur. Ent. 27 pp. [Abstract in Rev. Appl. Ent. (A) 8: 93-97. 1920.]

Satisfactory results against the blackhead fireworm (Rhopobota vacciniana) on cranberries were obtained from three applications of nicotine sulphate (40-percent) at 1 to 800 plus 2 lb. fish-oil soap per 50 gal. of spray. For tobacco thrips (Frankliniella fusca) 14 oz. nicotine sulphate plus 3 lb. soap to 50 gal. water has proved a successful spray if applied properly once a week during the emergency period.

FRANKLIN, H. J. (1811)

1921. REPORT OF THE CRANBERRY STATION FOR 1919 AND 1920. Mass. Agr. Expt. Sta. Bull. 206, pp. 149-168. [Abstract in Rev. Appl. Ent. (A) 11: 28. 1923.]

Winter-flooded bogs should be sprayed once, a few days before the blossoms are out with 1 gal. Black Leaf 40 in 400 gal. water with 16 lb. fish oil soap. This treatment largely takes the place of June reflooding in reducing the numbers of Rhopobota naevana Hb. (vacciniana Pack.) (the blackhead fireworm); Clastoptera vittata Ball.(the spittle insect); Crambus hortuellus (the cranberry girdler); leafhoppers (Euscelis) and springtails (Collembola).

CROWLEY, D. J. (1812)

1923. CRANBERRY INVESTIGATIONS IN PACIFIC COUNTY. Wash. Agr. Expt. Sta. Ann. Rept. 33 (1922-1923), Bull. 180, pp. 73-75. [Abstract in Rev. Appl. Ent. (A) 12: 239. 1924.]

Very good results against the cranberry fireworm (*Rhopobota naevana*) were obtained with nicotine sulphate at 1 to 400. At 1 to 800 it was ineffectual.

FRANKLIN, H. J. (1813)

1928. CAPE COD CRANBERRY INSECTS. Mass. Agr. Expt. Sta. Bull. 239, pp. 1-67, illus. [Abstract in Biol. Abs. 4 (6): 1825. Entry 19,295. 1930.]

Various methods of flooding, coupled with applications of nicotine sulphate and fish-oil soap, are recommended for control of the fir worm (*Rhopobota vacciniana* Pack.). Another fireworm (*Cacoecia parallel* Rob.) never important in flooded bogs, is readily controlled by nicotine-soap spray.

PLANK, H. K. (1814)

1922. THE BLACKHEAD FIREWORM OF CRANBERRY ON THE PACIFIC COAST. U. S. Dept. Agr. Bull. 1032, 46 pp., illus. [Abstract in Rev. Appl. Ent. (A) 10: 597. 1922.]

Experiments on a large scale proved the most effective spray to be 40-percent nicotine sulphate at 1 to 800 plus 2 lb. fish oil soap per 50 gal., using about 300 gal. to the acre. Nicotine sulphate at 1 to 1,000 gave results almost as good. Three applications of either should be made. Nicotine oleate made by mixing 2 1/2 parts of a solution containing 40 percent free nicotine with 1 3/4 parts of commercial oleic acid using 1 part to 400 parts of water applied 3 times at the rate of 300 to 400 gal. per acre was also nearly as effective. Fish-oil soap was a much better spreader than glue for cranberry foliage. On heavily infested vines a fourth application should be made during the first two weeks of July.

FRANKLIN, H. J. (1815)

1933. INJURIOUS AND BENEFICIAL INSECTS AFFECTING THE CRANBERRY. Mass. Agr. Expt. Sta. Bull. 293, pp. 21-25.

It was found that a spray containing 1 1/3 qt. nicotine sulphate 4 lb. soap, and 100 gal. water killed the larvae of the gypsy moth in all stages satisfactorily when used at the rate of 400 gal. per acre. The sprays were most effective when applied early in the morning, for then the larvae usually work in the tops of the cranberry vines where they are easily reached with a spray (p. 22).

A nicotine sulphate spray at the end of the cranberry blossoming period controls the fruit worm to a considerable extent. Most of the eggs well hit by a spray of 1 qt. nicotine sulphate in 100 gal. water fail to hatch. A spray of 1 1/3 qt. nicotine sulphate in 100 gal. water strongly repels the moths from laying eggs for at least 5 days. This spray with soap added controlled the cranberry spittle insect (p. 23).

10. Other Lepidoptera Harmful to Fruits, 1825-1934

BISSET, A. (1816)

1825. ON THE DESTRUCTION OF THE CATERPILLARS USUALLY FOUND ON GOOSEBERRY AND CURRANT BUSHES. Mem. Caledonian Hort. Soc. [Edinburgh] 3: 431-438.

It is well known that confined tobacco smoke is more or less destructive to a great variety of insects, but more especially to those of the fly tribe (p. 431).

A specially constructed tent was put over the gooseberry and currant bushes infested with caterpillars, and then tobacco smoke was forced into the tent by a special fumigating bellows. The ground beneath the bushes was covered with a cloth, upon which the stupefied caterpillars fell. The insects were collected and then destroyed. A five minutes' exposure was required before the tent was moved to another bush. Two people are able to fumigate 80 large bushes in a day, and a pound of damp tobacco is sufficient for about 140 full grown bushes.

BARSACQ, J. (1817)

1906. TRAITEMENTS MENSUELS CONTRE LES ENNEMIS DES ARBRES FRUITIERS. Le Jardin 20: 172.

Against caterpillars on apple trees it is recommended in France that the following emulsion should be applied twice in June: 2 kg. tobacco juice (at 15°), 500 g. carbolic acid, 1 kg. soap, and 100 l. water.

BEDFORD, THE DUKE OF, and PICKERING, S. U. (1818)

1908. Woburn Expt. Fruit Farm 8th Rept. [London]. 127 pp.

A tobacco decoction killed as high as 95 percent of the caterpillars on fruit trees (p. 84), and when it was mixed with alcohol an average of 97 percent were killed (p. 85). As high as 100 percent of the aphids on apple trees were destroyed, but most of the percentages of mortality are much lower (p. 97).

A 2 percent tobacco decoction killed 100 percent of the apple suckers after the eggs had hatched and before the blossoms had expanded. Instead of 2 percent of tobacco, 3 to 4 percent of tobacco powder may be used, but it is preferable to use a solution of nicotine of known strength (p. 123).

ANONYMOUS (1819)

1916. DESTRUCTION DES CHENILLES. Vie Agr. 6 (40): 248.

Fruit trees infested with aphids and caterpillars were sprayed with a mixture consisting of 1 l. tobacco extract, 1 kg. black soap, 200 g. sodium carbonate, 1 l. methyl alcohol, and 100 l. water. It was very effective.

SANDERS, G. E. (1820)

1919. APPLE SPRAYING. Maine Comn. Agr. 18th Ann. Rept., pp. 199-209. [Abstract in Rev. Appl. Ent. (A) 8: 529-530. 1920.]

Sucking insects may be controlled by the use of 3 lb. soluble sulphur and 1 pt. 40-percent nicotine sulphate to 120 gal. water. This was effective against cankerworms when applied before the larvae were half grown. It was also more efficacious than the dormant spray against the young oyster-shell scale.

SUSAINATHAN, P. (1821)

1923. FRUIT-SUCKING MOTHS OF SOUTH INDIA. Rept. Proc. 5th Ent. Meeting [Pusa] pp. 23-27, illus. [Abstract in Rev. Appl. Ent. (A) 12: 578. 1924.]

Effective mechanical means are hand-netting and enveloping each fruit in lotus leaves, which, owing possibly to their property of emitting a nicotine-like odor, repel the moths.

STELLWAAG, F. (1822)

1925. VERSUCHE MIT CHEMISCHEN BEKÄMPFUNGSMITTELN IN ÖSTERREICH. Anz. Schädlingskunde 1 (3): 30-31.

Cankerworms on fruit trees were sprayed with a mixture consisting of 1.5 to 2 percent of tobacco extract and 1 to 8 percent of lysol. Only the caterpillars which were hit by the spray perished; the others, more or less protected by the web, survived (p. 31).

HEADLEE, T. J., ET AL. (1823)

1930. REPORT OF THE DEPARTMENT OF ENTOMOLOGY. N. J. Agr. Expt. Sta. Rept. 1930, pp. 121-172, 175-200. [Abstract in Expt. Sta. Rec. 65: 847-850. 1931.]

Studies have shown that the larvae of the leopard moth are killed by treating the twigs and branches of infested apple trees with soluble pine oil in which has been dissolved nicotine (p. 848). Studies of the practical use of the reduced nicotine charge against various insects (pp. 168-169) are discussed (p. 849 of abstract).

HEADLEE, T. J., and ILG, C. (1824)

1926. SOME FACTS RELATIVE TO THE RASPBERRY CROWN BORER (BEMBECIA MARGINATA). Jour. Econ. Ent. 19: 471-477, illus. [Abstract in Rev. Appl. Ent. (A) 14: 449-450. 1926.]

Tobacco dust 1 lb. of 70-90 mesh containing 1.97 percent nicotine sifted over the crown of a raspberry plant and the surrounding soil followed by an application of 1 gal. water killed the advanced stage larvae without injuring the plant. The addition of water after applying tobacco dust greatly increases its efficiency and the use of 50 percent tobacco dust with 49 percent hydrated lime and 1 percent sodium carbonate greatly increases the rate of evolution of gas provided the mixture is moistened after application.

FEYTAUD, J., and SOURSAE, L. (1825)

1924. LES VERS DES PRINES EN LOT-ET-GARONNE. Prog. Agr. et Vitic. 82: 208-213.

A mixture of nicotine and bordeaux was applied against Carpocapsa funebrana on prune trees in France. The spray was applied three times during the latter half of April and first half of May. The foliage appeared better and a larger percentage of healthy fruit resulted (p. 210).

SCHNEIDER-ORELLI, O. (1826)

1917. THE CONTROL OF CHEIMATOBIA BRUMATA IN SPRING. Schweiz. Ztschr. Obst. u. Weinbau 26 (7): 97-101. [In German. Abstract in Rev. Appl. Ent. (A) 5: 270. 1917.]

A 2 percent tobacco extract was one of the insecticides used to control the larvae of the above insect on trees.

FEYTAUD, J. (1827)

1928. LES CHENILLES DU PRUNIER. LA CHENILLE VERTE (CHEIMATOBIA BRUMATA L.) Rev. Zool. Agr. 27 (1): 1-5, illus. [Abstract in Rev. Appl. Ent. (A) 16: 499. 1928.]

Arsenicals or nicotine sprays are useful when infestation is established on the trees.

MENZEL, R. (1828)

1931. ERGEBNISSE VON VERSUCHEN ZUR BEKÄMPFUNG DES FROSTSPANNERS MIT VERSCHIEDENEN MITTELN. Schweiz. Ztschr. Obst. u. Weinbau 40 (5-6): 116-117. [Abstract in Biol. Abs. 6 (10): 2331. 1932. Entry 22,674.]

Spraying with lime-sulphur mixture (2.5 percent), lead arsenate (1 percent), or calcium arsenate (0.4 percent) before and after blossoming of the trees gave good results against the winter moth (Cheimatobia brumata) in contrast to different nicotine contact sprays.

BRUNETEAU, J. (1829)

1932. ABOUT THE INFESTATIONS OF THE SPHINGID, DEILEPHILA LINEATA VAR. LIVORNICA ESP. Rev. Zool. Agr. 31 (1): 9-15. [In French. Abstract in Rev. Appl. Ent. (A) 20: 558-559. 1932.]

Spraying with bordeaux mixture or nicotine is advised as a control measure against this moth on vines and buckwheat.

SCHLICKENRIEDER, J. (1830)

1894. VERTILGUNG DER STACKELBEER-RAUPEN. Möller's Deut. Gärt. Ztg. 9: 248.

Gooseberries infested with caterpillars [Geometra (Zerene) grossulariata] were dusted with tobacco dust. The caterpillars dropped dead from the plants.

DOWNES, W. (1831)

1929. THE CHERRY FRUIT WORM (GRAPHOLITHA PACKARDI ZELL.) Proc. Ent. Soc. Brit. Columbia 1929, No. 26, pp. 39-43, illus. [Vancouver]. [Abstract in Rev. Appl. Ent. (A) 18: 343-344. 1930.]

The following formula: 1 pt. Volck oil, 3 oz. nicotine sulphate, 3 oz. calcium caseinate and 12 gal. water applied when moth [Cydia (Grapholitha) packardi Zell.] emergence was at its height gave good results. This spray appears to have a repellent as well as an ovicidal effect. On the treated trees the infestation was 2.36 percent as compared to 19.08 percent on the unsprayed ones and 8.06 percent on those to which a spray of 3/4 pt. nicotine sulphate to 40 gal. water and 5 lb. fish oil soap was applied.

DOWNES, W. (1832)

1931. THE CHERRY FRUIT WORM AND ITS CONTROL IN BRITISH COLUMBIA. Canada Dept. Agr. Circ. 79, 3 pp., illus. [Abstract in Rev. Appl. Ent. (A): 21: 194. 1933.]

A spray recommended against Cydia (Grapholitha) packardi Zell. consists of 1 gal. summer oil emulsion, 1/2 pt. nicotine sulphate (40 percent), 3/4 lb. casein spreader, and 50 gal. water. The spray should be applied within a week after the height of emergence of the moths, in order to destroy the maximum number of eggs.

FAES, H. (1833)

1926. LES ATTAQUES SUR FEUILLES DE POMMIER DE LA CHENILLE DE SIMAETHIS PARIANA. Ann. Agr. Suisse 27 (1): 123-125, illus. [Abstract in Rev. Appl. Ent. (A) 14: 307-308. 1926.]

The larvae of Hemerophila (Simaethis) pariana are injurious to apple foliage. Arsenicals are most efficacious but soft soap (2 percent and concentrated tobacco extract (1 percent) may be substituted.

(There is no page 427.)

FAES, H., and TONDUZ, P. (1834)

1927. RAPPORT ANNUEL - 1926. STATION FEDERALE D'ESSAIS VITICOLES À LAUSANNE ET DOMAINE DE PULLY. A. DIVISION DE PHYSIOLOGIE ET PATHOLOGIE VÉGÉTALE. Ann. Agr. Suisse 28 (4): 347-355. [Abstract in Re Appl. Ent. (A) 16: 169. 1928.]

Arsenicals, or soap solutions containing nicotine or liver of sulphur were successfully used in controlling *Hemerophila* (*Simaethis*) *pariana* L. which caused russeting of apple foliage.

WILSON, G. F. (1835)

1928. TWO LESSER KNOWN PESTS OF FRUIT TREES. Gard. Chron. [London] 83 (2163): 416-418, illus. [Abstract in Rev. Appl. Ent. (A) 16: 376. 1928.]

The most successful control is spraying with lead arsenate or nicotine and soap before the larvae of the tineid moth (*Hemerophila pariana* Cl.) spin their webs.

LUNDBLAD, O. (1836)

1930. *INCURVARIA TRIMACULELLA QUADRIMACULELLA* HOFN., A MOTH HITHERTO UNKNOWN AS A PEST OF CURRANTS AND NEW TO SWEDEN. Meddel. Centralanst Försöksv. Nordbruksområdet [Sweden] No. 374, Lantbruksentom. Avd. No. 59, 25 pp. [In Swedish. Abstract in Rev. Appl. Ent. (A) 18: 694-695. 1930.]

The eggs and the young mining larvae may be killed by spraying with various nicotine preparations.

FAES, H., STAEHELIN, M., and BOVEY, P. (1837)

1934. LA LUTTE CONTRE LES ENNEMIS DES ARBRES FRUITIERS, INSECTES ET CHAMPIGNONS EN 1932. Landw. Jahrb. Schweiz. 48 (3): 241-280, illus. [Abstract. In Rev. Appl. Ent. (A) 22: 432. 1934.]

The addition to bordeaux mixture of 1 percent nicotine applied on June 10 against the first generation and on July 25 against the second generation of *C.* (*Laspeyresia*) *funebrana* Treit. proved an effective measure.

NISHIGAYA, J. (1838)

1918. ON THE CATERPILLARS OF *LYMANTRIA MATHURA* MOORE THAT APPEARED IN ABUNDANCE ON THE APPLE IN 1918. Insect World 22: 13-20. [Abstract i Rev. Appl. Ent. (A) 6: 504. 1918.]

Spraying the small caterpillars in the middle of June with any insecticide is very effective. For the spray kerosene emulsion (1:20) is good by itself or mixed with insect powder (1:30) or with tobacco (1:20) or with fish oil (1:20), the last being the best of all.

ODA, F. (1839)

1934. ON THE SERIOUS OUTBREAK OF LYONETIA CLERKELLA, LINN., AT NITTAHARA, FUKUOKA PREFECTURE. Jour. Plant Protect. 21 (1): 46-52. [In Japanese. Abstract in Rev. Appl. Ent. (A) 22: 239. 1934.]

In 1933 there was a serious outbreak of this pest of peach in Japan, but the injury was minimized by spraying with a derris preparation and nicotine sulphate, which are effective against the moths as well as the larvae.

HAEGELE, R. W. (1840)

1932. SOME RESULTS WITH PYRETHRUM IN THE CONTROL OF MINEOLA SCITULELLA HULST (LEPIDOPTERA, PYRALIDAE). Jour. Econ. Ent. 25 (5): 1073-1077. [Abstract in Rev. Appl. Ent. (A) 20: 695. 1932.]

Promising results were obtained with sprays containing pyrethrum to control the overwintered larvae in the buds of prune trees. The materials tested were pyrethrum extracts used in combination with various insecticides, including nicotine sulphate and nicotine.

LEEFMANS, S. (1841)

1916. THE PISANG MOTH, NACOLEIA OCTASEMA MEYR. AND ITS CONTROL. Meded. Laboratorium v. Plantenziekten, No. 23, 32 pp., illus. [Abstract in Rev. Appl. Ent. (A) 5: 278. 1917.]

Both tobacco dust and powdered unslaked lime proved ineffective against larvae of a pyralid moth (Nacoleia octasema Meyr.) on bananas. Successful control was effected by dusting the banana bunches when just opening with 1 part pyrethrum powder and 3 parts finely sifted ashes or preferably 3 parts powdered lime.

GRAM, E., and ROSTRUP, S. (1842)

1925. REPORT ON PLANT DISEASES AND PESTS IN DENMARK IN 1924. Tidsskr. Planteavl. 31: 353-417. [In Danish. Abstract in Rev. Appl. Ent. (A) 13: 536-537. 1925.]

Early spraying with a very fine mist of nicotine proved effective against the larvae of Oxygrapha (Acalla) comariana infesting strawberry leaves. In tests of various insecticides nicotine (2 per mille and 1 percent soap) was effective against pierid larvae (75 percent killed).

WELDON, G. P. (1843)

1918. PEAR GROWING IN CALIFORNIA. Calif. State Comn. Hort. Monthly Bull. 7 (5): 371-407, illus. [Abstract in Rev. Appl. Ent. (A) 6: 384-385. 1918.]

Nicotine or lead arsenate sprays are recommended against the spring cankerworm (Palaeacrita vernata). Pear slugs (Eriocampoides *limacina*) of the second generation are sprayed with two applications of nicotine or other contact spray.

HEADLEE, T. J. (1844)

1927. REPORT OF THE DEPARTMENT OF ENTOMOLOGY. N. J. Agr. Expt. Sta. Rept. 1925-26, pp. 151-237, illus. [Abstract in Rev. Appl. Ent. (A) 16: 132-133. 1928.]

Tobacco dust is far more efficient than 40-percent nicotine sulphate in controlling the raspberry crown borer (*Pennisetia marginata* Harr.). Tobacco dust (100 mesh) was sifted on the hill and covered thinly with soil; then 1 gal. water was poured on.

11. Cabbage Insects, 1910-1934

VODOLAGIN, V. (1845)

1925. *EURYDEMA ORNATUM* L., AND ITS CONTROL. Astrakhan Sta. Plant Protect., Leaflet 54, 4 pp. [In Russian. Abstract in Rev. Appl. Ent. (A) 13: 475. 1925.]

The remedial measures recommended are hand collection of eggs on cabbages, and spraying with soap solution, tobacco extract or kerosene emulsion.

CHITTENDEN, F. H., and MARSH, H. O. (1846)

1912. THE IMPORTED CABBAGE WEBWORM (*HELLULA UNDALIS* FAB.). U. S. Dept. Agr. Bur. Ent. Bull. 109, Part III, 45 pp., illus.

A mixture, consisting of 2 lb. Paris green, 8 lb. whale-oil soap, 25 oz. nicotine sulphate, and 100 gal. water, was sprayed on cabbage plants in Hawaii. It completely wiped out the plant lice and several species of lepidopterous larvae on the leaves, but it was ineffective against the well-protected Hellula larvae.

FERDINANDSEN, C., LIND, J., and ROSTRUP, S. (1847)

1919. REPORT ON INSECT PESTS AND DISEASES OF THE ORCHARD IN 1916 AND 1917. Tidsskr. Planteavl. 26: 297-334. [In Danish. Abstract in Rev. Appl. Ent. (A) 7: 447-450. 1919.]

In experiments conducted by the Government Experiment Station the measures that proved effective against the larvae of *Pieris* included dusting with tobacco dust.

GORIAINOV, A. (1848)

1916. EXPERIMENTS WITH SOME VEGETABLE AND MINERAL INSECTICIDES. THE PROTECTION OF PLANTS FROM PESTS. Sup. to Friend of Nature No. 1-2 (28-29), pp. 1-28. [In Russian. Abstract in Rev. Appl. Ent. (A) 5: 24-26. 1917.]

Insects in wire cages were fed food plants moistened with decoctions of insecticidal plants, the food being changed every day. Experiments showed a decoction of tobacco (Nicotiana rustica) to be effective as a stomach poison. Tobacco decoction prepared by boiling 1 lb. of tobacco in 3 gal. of water and diluting the strained liquid in another 6 gal. of water produced a death rate among caterpillars of P. brassicae as high as 62.5 percent.

FEYTAUD, J. (1849)

1918. NOTES ON THE CABBAGE BUTTERFLY. Bull. Soc. Étude Vulg. Zool. Agr. 17 (5): 33-38. [In French. Abstract in Rev. Appl. Ent. (A) 6: 319-320. 1918.]

A solution of black soap (5 percent) and nicotine (1 to 1 1/2 percent of titrated extract) is a very active insecticide applied directly to the larvae of Pieris brassicae L. and is also very effective as a preventive spray during the oviposition period.

JEGEN, G. (1850)

1918. CONTRIBUTIONS TO THE WORK OF COMBATING THE CABBAGE BUTTERFLY. Landw. Jahrb. Schweiz. 32 (4): 524-550. [In German. Abstract in Rev. Appl. Ent. (A) 7: 512-514. 1919.]

Preventive measures against Pieris brassicae include the spraying of cabbage seedlings with a 2-percent nicotine solution to repel the ovipositing butterflies. Spraying must be repeated from time to time as the repellent effect has been found to disappear in about 9 days.

LEES, A. H. (1851)

1918. NICOTINE-PARAFFIN EMULSION. Jour. Bd. Agr. [London] 24 (12): 1411-1415. [Abstract in Rev. Appl. Ent. (A) 6: 238-239. 1918.]

The following spray: soft soap, 20 lb., paraffin, 2 gal., nicotine, 1/2 lb., water, 100 imperial gal., kills capsids if they are thoroughly wetted. Larvae of the cabbage white butterfly (Pieris brassicae) remained motionless on the leaves and finally died. Larvae of the gooseberry sawfly (Pteronus ribesii) and the raspberry and loganberry beetle (Byturus tomentosus) are killed only if thoroughly wetted.

GHIRLANDA, C. (1852)

1922. THE CABBAGE WORM. Costa Azzurra Agr. - Floreale 2 (9): 8-11, illus. [In Italian.]

The following spray mixture has given good results against the cabbage worm (Pieris brassicae L.) in Italy: 2 l. phenicated tobacco extract (5 percent), 2 l. denatured alcohol, 200 g. black soap, and 96 l. water.

OHLERS, H. (1853)

1925. DER KOHLWEISSLING. Mitt. Deut. Landw. Gesell. 40: 646. 1925.

Of the various insecticides which have been tested in Denmark to control the larvae of butterflies (Pieris brassicae and P. rapae), the following spray mixture has given the best results: 2 percent nicotine (10-percent), 100 g. soap, and 10 l. water.

LINDBLOM, A. (1854)

1928. INVESTIGATIONS ON INSECTICIDES. Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden] No. 330, Landbruksent Avdel. No. 53, 33 pp., illus. [In Swedish. Abstract in Rev. Appl. Ent. (A) 16: 612-613. 1928.]

Nicotine has about equal efficiency against the eggs of Pieris brassicae L. whether pure or as a sulphate provided it is not influenced by other components of the mixture. Pure nicotine does not adhere well and an adhesive that does not lower its insecticidal power must be combined with it.

WILSON, H. F., and GENTNER, L. G. (1855)

1918. THE IMPORTED CABBAGE WORM IN WISCONSIN. Jour. Econ. Ent. 11: 79-81, illus. [Abstract in Rev. Appl. Ent. (A) 6: 201. 1918.]

Tobacco dust and lime apparently had no effect upon the larvae of the cabbage butterfly (Pieris rapae).

HARGREAVES, E. (1856)

1924. THE ACTION OF SOME ORGANIC COMPOUNDS WHEN USED AS STOMACH POISONS FOR CATERPILLARS. Bull. Ent. Res. 15 (1): 51-56.

A 1-percent nicotinic acid in a starch suspension killed only 2 cabbage worms (Pieris rapae L.) in 11 days (p. 53). A 1-percent nicotine (95 to 98-percent) emulsion killed only 4 cabbage worms in 7 days and only 2 caterpillars of Spilosoma lubricipeda Esp. in 9 days (p. 55).

HUCKETT, H. C. (1857)

1934. FIELD TESTS ON LONG ISLAND OF DERRIS AS AN INSECTICIDE FOR THE CONTROL OF CABBAGE WORMS. Jour. Econ. Ent. 27: 440-445.

The infestation was largely due to Pieris rapae, but later in the season Plutella maculipennis and Autographa brassicae became increasingly numerous. Talc, clay, and tobacco dust gave promise of being satisfactory diluents for derris dusts, which have given satisfactory results in the field for the control of cabbage worms.

FROGGATT, W. W. (1858)

1910. THE DIAMOND-BACKED CABBAGE MOTH (PLUTELLA CRUCIFERARUM ZELLER.). Agr. Gaz. N. S. Wales 21 (10): 894-899, illus.

The market gardeners in New South Wales dust their cabbages with one part of tobacco dust and four parts of fresh-slaked lime, thoroughly mixed. The dusting is done while the leaves are wet with dew and the powder is death to all insects that feed upon the surface of the leaves.

TAYLOR, W. H. (1859)

1922. THE GARDEN. Jour. Dept. Agr. New Zeal. 24: 115-116.

Black Leaf 40 (1 pt. to 100 gal. water) is an effectual poison spray against the cabbage moth (Plutella cruciferarum) in New Zealand, but particular attention must be paid to the underside of the leaves.

GURNEY, W. B. (1860)

1924. TO CONTROL CABBAGE MOTH. Agr. Gaz. N. S. Wales 35 (5): 325. [Abstract in Rev. Appl. Ent. (A) 12: 373-374. 1924.]

To protect cabbage plants from Plutella maculipennis (cabbage moth) persistent spraying in the seed beds and later in the field with kerosene emulsion or tobacco wash is useful.

JARVIS, H. (1861)

1926. SUNDRY NOTES ON INJURIOUS INSECTS OF THE STANTHORPE DISTRICT. Queensland Agr. Jour. 26 (1): 77-78, illus. [Abstract in Rev. Appl. Ent. (A) 14: 549. 1926.]

A spray of 3 oz. paris green, 2 1/4 oz. 40-percent nicotine sulphate, 12 oz. soap and 9 to 10 imperial gal. water is very effective in controlling an army worm (Cirphis unipuncta Haw.) and also the cabbage moth Plutella maculipennis Curt. (Cruciferarum Zell.) and the pumpkin beetle (Aulacophora sp.).

THEOBALD, F. V. (1862)

1926. THE DIAMOND BACK MOTH (PLUTELLA MACULIPENNIS). Jour. Kent Farmers' Union 20 (3): reprint, 7 pp., illus. [Abstract in Rev. Appl. Ent. (A) 14: 594. 1926.]

The best remedy is to brush as many as possible of the larvae off the plants by mechanical means and follow this treatment with a nicotine or lead arsenate spray or dust.

TEMPLE, W. (1863)

1928. WORK AGAINST THE CABBAGE MOTH. Kranke Pflanze 5 (8): 121-122, illus. [In German. Abstract in Rev. Appl. Ent. (A) 16: 655. 1928.]

If the hearts of cabbages have closed, the plants may be dusted with a mixture of 1 part tobacco dust and 4 parts lime, or a mixture of 5 parts nicotine sulphate and 95 parts lime, or they may be sprayed with nicotine or quassia to kill the larvae of the above moth (*Plutella maculipennis* Curt.)

THEOBALD, F. V. (1864)

1928. ENTOMOLOGICAL DEPARTMENT. So. East. Col. Wye, Res. and Adv. Dept Rept. 1927-28, reprint, 19 pp., [Kent.] [Abstract in Rev. Appl. Ent. (A) 17: 122-123. 1929.

Two or more washes of nicotine and soft soap effected successful control of the diamond back moth (*Plutella maculipennis* Curt.), but this treatment was too costly in most cases. Against capsid bugs (*Lygus pabulinus* L.) good results were obtained by spraying first the bushes and then the soil beneath them with 10 oz. nicotine and 3 lb. soft soap to 100 gal. water.

HÜLSENBERG, H. (1865)

1929. OBSERVATIONS ON THE OCCURRENCE OF *PLUTELLA MACULIPENNIS* CURT. IN THE ERFURT CAULIFLOWER DISTRICT IN 1928. Kranke Pflanze 6 (5): 88-91. [In German. Abstract in Rev. Appl. Ent. (A) 17: 487. 1929.]

Arsenical sprays were unsatisfactory against *Plutella maculipennis* Curt. (*cruciferarum* Zell.), the best results being obtained with nicotine soap.

MORGAN, W. L. (1866)

1929. PRELIMINARY EXPERIMENTS IN CABBAGE MOTH CONTROL. Agr. Gaz. N. S. Wales 40 (10): 761-766. [Abstract in Rev. Appl. Ent. 18: 127-128. 193

During a favorable season 80 to 90 percent of the crop is rendered marketable by dusting with lime and tobacco. If the winter is late, however, severe damage to the crop may occur, if nicotine sulphate spray proved ineffective. Dusting with equal parts of lime and tobacco apparently repelled the larvae from the centers of the plants. Very promising results were obtained by dusting and spraying (1 1/2 lb. lead arsenate to 50 gal. water) alternately and this procedure is recommended for the control of the cabbage moth (*Plutella maculipennis* Curt.).

JARVIS, H. (1867)

1931. CABBAGE MOTH CONTROL BY NON-ARSENICAL SPRAYS. Queensland Agr. Jour. 36 (4): 399-403. [Abstract in Rev. Appl. Ent. (A) 20: 99. 1932.]

As spraying cabbages with lead arsenate has not given satisfactory control of *Plutella maculipennis* Curt., one plot was treated with a derris preparation and a second with a spray composed of 1/2 pt. nicotine sulphate, 2 lb. soap, 1 lb. lead arsenate, and 40 gal. water. Both preparations gave fairly satisfactory control, but the derris preparation was more toxic to both larvae and pupae, and the plants treated with it were cleaner and better grown.

MORGAN, W. L. (1868)

1931. EXPERIMENTS IN CABBAGE MOTH (*PLUTELLA MACULIPENNIS*) CONTROL, 1930. Agr. Gaz. N. S. Wales 42 (1): 57-58. [Abstract in Rev. Appl. Ent. (A) 19: 298-299. 1931.]

The lead arsenate dust gave the best results. For seedbeds, a 2.5 percent nicotine dust, applied every day or two, according to the degree of infestation, is effective. Dusting with arsenicals should cease a month before cutting, owing to the danger of poison, but a nicotine dust may be used instead if necessary.

WALKER, H. G., and ANDERSON, L. D. (1869)

1934. NOTES ON THE USE OF DERRIS AND PYRETHRUM DUSTS FOR THE CONTROL OF CERTAIN INSECTS ATTACKING CRUCIFEROUS CROPS. Jour. Econ. Ent. 27: 388-393.

In comparative tests with diluents or carriers for dusts against the cabbage looper (*Autographa brassicae* Riley) and larvae of the diamond-back moth (*Plutella maculipennis* Curt.) finely ground tobacco dust gave almost as good control as talc and gypsum.

GUNN, D. (1870)

1918. THE SMALL CABBAGE MOTH. Queensland Agr. Jour., 2nd ser., 9: 204-206, illus.

The following spray mixture was found to destroy the larvae of this moth: 1 gal. tobacco extract (not less than 6 percent nicotine), 50 gal. water, and 2 lb. soap or resin.

RIVOIRE, P. (1871)

1923. TO COMBAT CABBAGE-BUTTERFLY LARVAE. Agr. Nouvelle 33 (1396): 330, illus. [In French.]

The following spray mixture is recommended in France: 1.5 l. titrated nicotine (10-percent), 1.5 l. denatured alcohol (90-percent), 200 g. black soap, and 400 l. water.

GLEISBERG, W. (1872)

1929. GROSSVERSUCH ZUR KOHLSCHABENBEKÄMPFUNG 1928. Obst. u. Gemüsebau 75 (1): 2-6, illus. [Abstract in Biol. Abs. 5 (11): 2889-2890. Entry 28781. 1931.]

Large quantities of tobacco extract, kerosene, and lysol soap emulsions were used in a comparative test of these substances on an area of 1,771.5 acres of cabbage infested by the cabbage moth. Tobacco soap emulsion (1 percent tobacco extract: 8-10 percent nicotine: 2 percent soap) gave the best results.

12. European Corn Borer and Corn Ear Worm, 1905-1934

CAFFREY, D. J. (1873)

1925. STATUS OF THE EUROPEAN CORN BORER IN THE UNITED STATES IN 1924. Jour. Econ. Ent. 18: 98-109. [Abstract in Rev. Appl. Ent. (A), 13: 244-245. 1925.]

A 2 percent free nicotine dust gave encouraging results in 1924 when applied at the period of maximum egg hatching.

WILKE, S. (1874)

1925. DER STAND DER MAISZÜNSLERFRAGE. Arch. Naturgeschichte, Abt. A 91 (9): 31-72, illus.

The European corn borer larvae (Pyrausta nubilalis Hb.) can only be reached just after hatching from the eggs, during which time it is advisable to dust the plants with an arsencial or 2 percent tobacco powder (p. 64).

ANONYMOUS (1875)

1931. REPORT OF EUROPEAN CORN BORER SYMPOSIUM AGRICULTURAL CONFERENCE 1931. Ind. Agr. Expt. Sta. Stencil Bull. 5, 15 pp. [Abstract in Rev. Appl. Ent. (A) 19: 476-477. 1931.]

Sweet corn, which is the first to be planted, is likely to receive the first severe infestation in Indiana. In studies with insecticides, nicotine and Penetrol have given 85 percent control of Pyrausta nubilalis Hb. under the favorable conditions prevailing during the 1930 season.

BATCHELDER, C. H., and QUESTEL, D. D. (1876)

1931. INSECTICIDAL CONTROL OF THE EUROPEAN CORN BORER: THE PROBLEMS INVOLVED AND SOME EXPERIMENTAL RESULTS. Jour. Econ. Ent. 24 (6) 1152-1167, illus. [Abstract in Rev. Appl. Ent. (A) 20: 132-133. 1932.]

Insecticides involving the use of nicotine and pyrethrum were found impractical in their present physical form for use against this moth (Pyrausta nubilalis Hb.).

SIMANTON, F. L., DICKE, F. F., and BOTTGER, G. T. (1877)

1931. THE LETHAL POWER OF CERTAIN INSECTICIDES TESTED IN MICHIGAN AGAINST THE EUROPEAN CORN BORER. Jour. Econ. Ent. 24: 395-404. [Abstract in Rev. Appl. Ent. (A) 19: 483-484. 1931.]

Nicotine did not prove sufficiently toxic to justify its use.

FICHT, G. A. (1878)

1933. A PROGRESS REPORT ON SOME INSECTICIDES USED AGAINST THE EUROPEAN CORN BORER. Jour. Econ. Ent. 26: 747-754. [Abstract in Rev. Appl. Ent. (A) 21: 596. 1933.]

Nicotine added to oil emulsions did not appreciably affect the results obtained in experiments against the corn borer (Pyrausta nubilalis Hb.).

QUAINTANCE, A. L., and BRUES, C. T. (1879)

1905. THE COTTON BOLLWORM. U. S. Dept. Agr. Bur. Ent. Bull. 50, 155 pp., illus.

Bishopp and Jones put tobacco on the corn silks and ears to prevent this moth (Heliothis obsoleta Fabr.) from ovipositing, but the results were negative (p. 133).

JACK, R. W. (1880)

1925. NOTES FROM THE ENTOMOLOGICAL LABORATORY. Rhodesia Agr. Jour. 22 (8): 852-855. [Abstract in Rev. Appl. Ent. 14: 11. 1926.]

A combined spray of 1 gal. lime-sulphur, 9 oz. 40-percent nicotine sulphate, 7 oz. universal spreader and 100 gal. water, applied primarily against aphids and thrips apparently had some effect in controlling the caterpillars Heliothis (Chloridea) obsoleta F. but further investigations in this connection are necessary. The black citrus aphid (Aphis tavaresi Del Guer.) is easily killed with nicotine sprays.

FREEBORN, S. B., and WYMORE, F. H. (1881)

1929. ATTEMPTS TO PROTECT SWEET CORN FROM INFESTATIONS OF THE CORN EAR WORM, HELIOTHIS OBSOLETA FABR. Jour. Econ. Ent. 22: 666-671. [Abstract in Rev. Appl. Ent. (A) 17: 724. 1929.]

Poor results were obtained with arsenates and various nicotine combinations including a new proprietary nicotine caseinate.

BURDETTE, R. C. (1882)

1934. RESULTS OF TWO YEARS' WORK WITH AN ATTRACTIVE SPRAY FOR CORN EAR WORM MOTH (HELIOTHIS OBSOLETA FAB.) Jour. Econ. Ent. 27: 213-217.

Nicotine sulphate did not kill the moths, but it acted as a repellent (p. 213).

13. Lepidoptera Harmful to Shrubs, Shade and Forest Trees, 1905-1934

LESNE, P. (1883)

1905. LA LUTTE CONTRE LES INSECTES DU ROSIER. Rev. Hort. 77: 222-223.

Against caterpillars on rose bushes the following spray mixture is recommended: 1 l. concentrated tobacco juice, 1,500 g. black soap, 1,000 g. sodium carbonate, 1 l. methyl alcohol, and 100 l. water.

AHLBERG, O. (1884)

1927. *ARGYRESTHIA CONJUGELLA* ZELL., A REPORT ON INVESTIGATIONS IN 1921-1926. Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden] No. 324 (Lantbruksentom Avd. No. 52), 127 pp., illus. [In Swedish. Abstract in Rev. Appl. Ent. (A) 16: 235-236. 1928.]

A spray containing 0.1 percent nicotine killed about 88 percent o the eggs. It should be applied 30 days after the moths first appear and again 12 days later.

BURKE, H. E. (1885)

1932. SUMMARY OF SHADE-TREE INSECT ACTIVITIES IN CALIFORNIA FOR 1931. Calif. Dept. Agr. Monthly Bull. 21 (7-9): 358-369, illus. [Abstract in Rev. Appl. Ent. (A) 21: 46-47. 1933.]

The tineid larvae of *Argyresthia cupressella* Wlsm. on cypress could probably be controlled with the oil-nicotine spray recommended against *Epinotia subviridis* Heinr. Spraying with 1.5 to 2 percent lime-sulphur containing nicotine sulphate (1:800) gave good control of aphids [*Neochinosis* (*Dilachnus*) *tujafilinus* Del. G.] and a combined oil-nicotine spray was also of value in nurseries. *Epinotia subviridis* Heinr. caused injury to cypress from February to May. A combined oil-nicotine spray applied to the foliage about May 1st should prove effectiv

BRITTON, W. E., and ZAPPE, M. P. (1886)

1922. AN OUTBREAK OF THE ARBO-VITAE LEAF MINER *ARGYRESTHIA THUIELLA* PACKARD. Conn. Agr. Expt. Sta. Bull. 234, pp. 157-160. [Abstract in Rev. Appl. Ent. (A) 10: 335, 1922.]

Results of spraying tests with nicotine sulphate and other insecticides were inconclusive.

HUTCHINGS, C. B. (1887)

1926. THE BIRCH LEAF SKELETONIZER *BUCCULATRIX CANADENSISELLA* CHAMB. Ontario Ent. Soc. 56th Ann. Rept. 1925, pp. 69-71. [Abstract in Rev. Appl. Ent. (A) 15: 40. 1927.]

Ornamental birches can be protected from serious injury by spraying with lead arsenate or nicotine sulphate about the middle of August when the mines begin to show.

HUIE, L. H. (1888)

1917. EUDEMIS NAEVANA HB. THE HOLLY TORTRIX MOTH. Roy. Phys. Soc., Edinb., Proc. 20 (3): 164-178, illus. [Abstract in Rev. Appl. Ent. (A) 6: 117-118. 1918.]

Spraying the newly hatched larvae and those in the first or second instar with nicotine gave better control than spraying with paris green, lead arsenate, or lead chromate.

TRIMBLE, F. M. (1889)

1924. THE AZALEA LEAF MINER (LEPID.: TINEIDAE). Ent. News 35 (8): 275-279, illus. [Abstract in Rev. Appl. Ent. (A) 12: 542. 1924.]

This moth (Gracilaria azaleella Brants) may be controlled in greenhouses by cyanide fumigation, previous to forcing, followed in the forcing house by fumigations with nicotine sulphate on alternate nights to kill the newly hatched larvae.

FLACHS (1890)

1926. THE AZALEA MOTH AS A NEW PEST OF HORTICULTURE IN MUNICH. Ent. Ztschr. 39 (44): 177-178. [Abstract in Rev. Appl. Ent. (A) 14: 194. 1926.]

Control of Gracilaria azaleella Brants consists in spraying with a 1 percent tobacco mixture or with soapy water mixed with tobacco extract.

HODGSON, W. E. H. (1891)

1927. THE AZALEA LEAF MINER, GRACILARIA AZALEELLA BRANTS. Jour. Roy. Hort. Soc. 52 (1) 54-59, illus. [Abstract in Rev. Appl. Ent. (A) 15: 118-119. 1927.]

Repeated applications of a spray consisting of 1 oz. nicotine and 4 oz. soap to 10 imperial gal. water proved an almost complete failure.

WAHL, B., and ZIMMERMANN, H. (1892)

1909. VERSUCHE ÜBER DIE VERWENDBARKHEIT WÄSSERIGER LÖSUNGEN VON LYSOL UND KUPFERLYSOL (KYROL) ZUM PFLANZENSCHUTZ. Ztschr. Landw. Versuchsw. Österr. 12: 149-156.

Against the larvae of Gracilaria syringella F. on lilac a spray mixture, consisting of 1/4 percent lysol, 1.5 percent tobacco extract, and the remainder water, was very effective (p. 156).

HUTCHINGS, C. B. (1893)

1925. THE LILAC LEAF-MINER, *GRACILARIA SYRINGELLA* FABR. Ontario Ent. Soc. 55th Ann. Rept. 1924, pp. 19-23. [Abstract in Rev. Appl. Ent. (A) 13: 577-578. 1925.]

Nicotine sulphate sprays 1 1/2 to 2 tablespoonfuls per gal. were found very effective killing both the larvae in the mines and those in the rolled leaves.

WEISS, H. B. (1894)

1918. THE CONTROL OF IMPORTED PESTS RECENTLY FOUND IN NEW JERSEY. Jour. Econ. Ent. 11: 122-125. [Abstract in Rev. Appl. Ent. (A) 6: 204-205. 1918.]

Spraying with lead arsenate and fumigation with tobacco extract has afforded fair control of the azalea leaf-miner (*Gracilaria zachrysa* Meyr.). As regards the laurel psyllid (*Trioza alacris* Flor.), fumigation with tobacco smoke should be carried out during the winter while the trees are in storing sheds and the adults are hibernating.

FELT, E. P. (1895)

1930. THE NORWAY MAPLE *NEPTICULA* (*LEPIDOPTERA*). Wash. Ent. Soc. Proc. 32: 146-149. [Abstract in Rev. Appl. Ent. (A) 19: 206. 1931.]

A spray of 0.5 pt. nicotine, 3 lb. soap, and 2 qt. molasses to 40 gal. water, applied late in May, killed the adult tineid moths (*N. sericopeza* Zell.) and probably also prevented the emergence of others from the cocoons.

WALTER, G. (1896)

1925. DIE BEKÄMPFUNG DER FORLEULE UND DER NONNE. 86 pp., illus.

An experiment was undertaken in pine forests of Germany simultaneously with the airplane dusting to control the forleule and nun moths (*Panolis piniperda* and *Ocneria monacha*) by means of forming dense clouds of nicotine smoke, which was produced in iron pots by a mixture of nicotine dust and other material. It is assumed that anilin and naphthalin compounds were in the mixture (p. 43). The experiment was carried on by forming clouds beneath pine trees infested by caterpillars of these moths and by exposing the caterpillars in little bags to the fumes (p. 46). Both experiments were unsatisfactory (p. 66).

------ (1897)

1926. WORK AGAINST THE PINE MOTHS AND NUN MOTH IN THE FORESTRY DISTRICTS OF BIESENTHAL AND SORAU IN THE YEAR 1925. 86 pp., illus. Neudamm. [In German. Abstract in Rev. Appl. Ent. (A) 14: 338. 1926.]

As regards fumigation against the pine moth (Panolis flammea) and nun moth (Lymantria monacha), nicotine is the only substance of practical value; the material used as a carrier for the nicotine should be as free as possible from chemical substances other than the nicotine; each combustion-pot should be capable of generating a nicotine smoke cloud for 10 minutes; and fumigation must last 30 minutes in order to be successful and must be carried out when the wind is of the very slightest. These facts indicate that fumigation is always uncertain.

FRIEND, R. B. (1898)

1931. THE EUROPEAN PINE SHOOT MOTH. A POTENTIAL ENEMY OF PINES IN CONNECTICUT. Conn. Agr. Expt. Sta. Circ. 80, pp. 63-68, illus. [Abstract in Rev. Appl. Ent. (A) 19: 652. 1931.]

This moth (Rhyacionia buoliana Schiff.) has become a serious pest of imported pines. Certain sprays seem promising, one of the most satisfactory consisting of nicotine sulphate (1:400) and Penetrol to make 1 percent by volume.

HAMILTON, C. C. (1899)

1931. TESTS ON THE CONTROL OF SEVERAL INSECTS ATTACKING ORNAMENTAL PLANTS. Jour. Econ. Ent. 24: 162-169. [Abstract in Rev. Appl. Ent. (A) 19: 349. 1931.]

The European pine shoot moth (Rhyacionia buoliana Schiff.) was controlled by spraying infested trees during June with Penetrol (1:200) plus 40-percent nicotine sulphate (1:500). Three sprays applied at intervals of 7 to 10 days killed the adults hiding in the trees and the eggs laid upon the terminal twigs. Tests against thrips infesting privet showed that dust insecticides were more effective than liquid sprays and that the best materials were dusts containing nicotine tannate or ground pyrethrum flowers.

DE GRYSE, J. J. (1900)

1934. THE EUROPEAN PINE SHOOT MOTH (RHYACIONIA BUOLIANA SCHIFF.). Canada Dept. Agr. Spec. Circ. Div. Forest Insects, No. 9, 3 pp., illus. [Abstract in Rev. Appl. Ent. (A) 22: 496. 1934.]

Among the control measures mentioned (cf. 21: 567; 22: 394), a spray of 3 lb. lead arsenate, 3/4 pt. nicotine sulphate, 3 lb. potash fish-oil soap, and 40 gal. water has given satisfactory results against larvae that have not yet penetrated the buds.

FELT, E. P. (1901)

1934. SHADE TREE INSECTS IN 1933. Jour. Econ. Ent. 27: 195-200.

Spraying with a mixture, consisting of nicotine, oil, and lead arsenate, at the time the European pine shoot moths (Rhyacionia buoliana Shiff.) are in flight and during egg laying, has given very satisfactory control. Such treatment is obviously impractical in the case of average forest plantings (p. 198).

FRIEND, R. B., and WEST, A. S., JR. (1902)

1934. SPRAY EXPERIMENTS FOR THE CONTROL OF THE EUROPEAN PINE SHOOT MOTH Jour. Econ. Ent. 27: 334-336.

In comparative tests against this moth (*Rhyacionia buoliana*) the following percentages of control were obtained: Fish oil-lead arsenate, 95; nicotine sulphate (0.5 percent)-Penetrol-lead arsenate, 94; and nicotine sulphate (0.25 percent)-Penetrol-lead arsenate, 80. The cost of the nicotine-Penetrol mixture is excessive, so the lead arsenate fish oil seems most practicable.

SMITH, F. F., FISHER, H. J., and GUYTON, T. L. (1903)

1930. A PRELIMINARY REPORT ON THE CONTROL OF THE PINE TIP MOTH, *RHYACIONIA FRUSTRANA* (Comstock). Jour. Econ. Ent. 23 (1): 113-118. [Abstract in Biol. Abs. 5 (10): 2397. Entry 24,283. 1931.]

Several spray materials, including nicotine, were applied to pine trees infested with the above insect during its oviposition period.

BAKER, W. S. (1904)

1930. HOLLY INSECTS. Wash. State Hort. Assoc. Proc. 26: 183-184. [Abstract in Rev. Appl. Ent. (A) 20: 20-21. 1932.]

A pressure spray of 1 oz. 40-percent nicotine sulphate, 4 oz. fish-oil soap, and 3 oz. lead arsenate to 3 gal. water is recommended against the holly bud moth (*Rhopobota naevana* var. *ilicifoliana* Kearfott) At least one species of aphid occurs on holly, distorting the growth and gumming up the leaves, especially of the terminal shoots. A nicotine sulphate spray should give efficient control.

KRAUSSE, A. (1905)

1919. THE DESTRUCTION OF THE PINE PROCESSIONARY CATERPILLAR, *CNETHOCAMPA PINIVORA* TR. Ztschr. Forst. u. Jagdw. 51 (4): 202-205. [In German. Abstract in Rev. Appl. Ent. (A) 8: 141. 1920.]

As caterpillars of *Cnethocampa* (*Thaumetopoea*) *pinivora* Tr. were not available experiments were made with those of *Vannessa io* and *Dasychira pudibunda*. Carbolineum or nicotine was entirely successful in emulsions of 3 percent strength.

WOLF, M., and KRAUSSE, A. (1906)

1922. DIE FORSTLICHEN LEPIDOPTEREN. Jena, 337 pp.

Against the moth (*Thaumetopoea pinivora* Tr.) on pine trees spraying with a 3 to 4 percent solution of Floria nicotine soap A is recommended as being the best remedy to apply (p. 213).

14. Other Lepidoptera, 1902-1933

HARUKAWA, C. (1907)

1932. ON THE LIFE-HISTORY AND METHODS FOR THE CONTROL OF ACROCERCOPS ASTAUROTA MEYRICK. Agr. and Hort. 7 (8): 1407-1420, illus. [In Japanese. Abstract in Rev. Appl. Ent. (A) 20: 605. 1932.]

A nicotine spray is effective against the eggs of this tineid, and pyrethrum extract combined with oil emulsion against the larvae on fruit trees.

TULLGREN, A. (1908)

1918. THE ONION MOTH (ACROLEPIA ASSECTELLA ZELL.), AN INJURIOUS INSECT NOT HITHERTO RECORDED IN SWEDEN. Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden] No. 167, Ent. Avd., No. 30, 11 pp., illus. [In Swedish. Abstract in Rev. Appl. Ent. (A) 6: 286. 1918.]

The author suggests cutting off the parts attacked and destroying them and spraying with nicotine emulsion (1:1,000) as a remedial measure.

BOVIEN, P. (1909)

1932. THE LEEK MOTH, ACROLEPIA ASSECTELLA ZELL., AND ITS BIOLOGY. Tidsskr. Planteavl. 38: 334-344, illus. [In Danish with a summary in English. Abstract in Rev. Appl. Ent. (A) 20: 538. 1932.]

The best control measures were obtained with a 0.2 percent solution of nicotine.

ZACHER, F. (1910)

1914. DIE WICHTIGSTEN KRANKHEITEN UND SCHÄDLINGE DER TROPISCHEN KULTURPFLANZEN UND IHRE BEKÄMPFUNG. Band 1, Hamburg, 152 pp., illus.

Against the cotton worm Aletia argillacea Hübn. and the hawk moth Cyphonodes hylas L. the following spray mixture was used: 3 kg. tobacco extract, 3 kg. soft soap, 3 l. denatured alcohol, 500 g. powdered hellebore and 140 l. water (p. 56 and 130).

Against the larvae of the moths Porthesia virguncula Walk. and Capua coffearia Nietn. the following spray mixture was used: 3 kg. tobacco extract, 3 kg. soft soap, 1 kg. resin dissolved in 3 l. denatured alcohol, 3 l. spirit of sal ammoniac, 137 l. water (p. 128 and 146).

MALENOTTI, E. (1911)

1927. OBSERVATIONS ON ANTISPILA RIVILLEI STETT. Italia Vinic. ed Agr., 1927, No. 2, 3 pp. [In Italian. Abstract in Rev. Appl. Ent. (A) 15: 203. 1927.]

The cocoons of this tineid may be destroyed by crushing or treating with solutions of nicotine or tarry emulsions.

FERDINANDSEN, C., and ROSTRUP, S. (1912)

1920. REPORT ON INSECT PESTS AND FUNGUS DISEASES OF THE FIELD AND ORCHARD IN 1919. Tidsskr. Planteavl. 27: 399-450. [In Danish. Abstract in Rev. Appl. Ent. (A) 9: 362-364. 1921.]

Against the lepidopterous larvae, tobacco extract was used with effect. Sprays of tobacco extract containing 1 percent nicotine were successful against Blennocampa geniculata.

FRYER, J. C. F., STENTON, R., TATTERSFIELD, F., and ROACH, W. A. (1913)

1923. A QUANTITATIVE STUDY OF THE INSECTICIDAL PROPERTIES OF DERRIS ELLIPTICA (TUBA ROOT). Ann. Appl. Biol. 10: 18-34. [Abstract in Rev. Appl. Ent. (A) 11: 249-250. 1923.]

Tubatoxin and derride appear to be of the same order of toxicity as nicotine to the larvae of Bombyx mori. Nicotine oleate in low concentration was immediately and almost completely effective against Aphis rumicis.

YABUTA, T., and KOZU, T. (1914)

1931. THE TOXIC SUBSTANCE IN THE MULBERRY LEAVES, DAMAGED BY TOBACCO. Jour. Agr. Chem. Soc. Japan 7: 932-941. [Abstract in Chem. Abs. 26: 1008. 1932.]

The leaves of mulberry, planted near a tobacco field, were often toxic for the silkworm (Bombyx mori). The mulberry leaves damaged by tobacco were dried and then treated chemically. The resulting precipitate was changed into picrate and then recrystallized. It was identified as nicotine picrate. Mulberry leaves to which nicotine was artificially added, were also toxic for silkworms. In the damaged mulberry leaves nicotine combines with organic acid as salt. The quantity of nicotine was only 1/100,000 of the fresh leaves. It is difficult to remove nicotine from the damaged leaves.

RITCHIE, A. H. (1915)

1933. REPORT OF THE ENTOMOLOGIST, 1932. Ann. Rept. Dept. Agr. Tanganyika 1932, pp. 68-72. [Abstract in Rev. Appl. Ent. (A) 21: 444-445. 1933.]

As the period of seasonal activity of a moth (Cephonodes hylas L.) coincides with that of thrips, lead arsenate is added to the bordeaux nicotine combination spray (Rev. Appl. Ent. (A) 21: 106).

CHITTENDEN, F. H. (1916)

1913. THE ABUTILON MOTH (COSMOPHILA EROSA HÜBN.). U. S. Dept. Agr. Bur. Ent. Bull. 126, 10 pp., illus.

The following spray mixture killed about 95 percent of the larvae of this moth on abutilon plants in Virginia: 0.5 oz. 40-percent nicotine sulphate, 0.5 lb. whale-oil soap, and 5 gal. lukewarm water (p. 9).

RUNNER, G. A. (1917)

1914. THE SO-CALLED TOBACCO WIREWORM IN VIRGINIA. U. S. Dept. Agr. Bull. 78, 30 pp., illus.

A spray of tobacco extract at 1 to 500 was ineffective against this moth (Crambus caliginosellus Clem.). A spray of nicotine sulphate at 1 to 1,000 was not of much value in preventing injury by the worms, but seemed to repel flea beetles. Tobacco dust, scattered about tobacco plants directly after planting, may possibly have some value as a repellent (p. 26).

MOZNETTE, G. F. (1918)

1931. NOTES ON A DESTRUCTIVE LAWN INSECT. Fla. Grower 24 (22): 13. [Abstract in Expt. Sta. Rec. 46: 659. 1932; Rev. Appl. Ent. (A) 10: 445. 1932.]

Good results against Crambus haytiellus Zinck. attacking grasses were obtained from the use of tobacco dust applied with a dust gun. Where lawns were thus treated the larvae were either killed or they migrated from the dusted area.

AINSLIE, G. G. (1919)

1916. NOTES ON CRAMBIDS. Jour. Econ. Ent. 9: 115-119. [Abstract in Rev. Appl. Ent. (A) 4: 192. 1916.]

In Ohio, larvae of Crambus trisectus were best controlled by the use of tobacco dust.

NOBLE, W. B. (1920)

1932. SOD WEBWORMS AND THEIR CONTROL IN LAWNS AND GOLF GREENS. U. S. Dept. Agr. Circ. 248, p. 104. [Abstract in Biol. Abs. 7 (8): 1944. Entry 19,095. 1933.]

Nicotine sulphate (40-percent) solution gave little or no control against the larvae of moths of the genus Crambus (pyralidae).

HOLLOWAY, T. E., and LOFTIN, U. C. (1921)

1919. THE SUGAR-CANE MOTH BORER. U. S. Dept. Agr. Bull. 746, 74 pp., illus. [Abstract in Rev. Appl. Ent. (A) 7: 407-408. 1919.]

Canes for planting in uninfested areas should be obtained free from borers (Diatraea saccharalis crambidoides Grote) if possible otherwise they should be soaked for at least an hour in nicotine sulphate or bordeaux mixture, which prevents the eggs from hatching.

KIRSCHNER, R. (1922)

1931. CONTRIBUTIONS TO THE CONTROL OF *EPHESTIA ELUTELLA* HB. Mitt. Gesel Vorratsschutz 7 (4): 42-43, illus. [In German. Abstract in Rev. Appl. Ent. (A) 19: 616. 1931.]

An extremely severe infestation of this moth, in the storerooms of a food-products factory in which fumigation was impossible, was succes fully controlled by removing the stock, spraying the rooms with a solutio of nicotine and soap, and smearing all cracks with a paste of water glass and plaster of paris.

NAGEL, W. (1923)

1931. DIPYRIDYLS IN PEST CONTROL. Anz. Schädlingsk. 7 (12): 137-139, illus. [In German. Abstract in Rev. Appl. Ent. (A) 20: 234. 1932.]

Larvae of the moth *Ephestia kühniella* Zell. were dipped for 30 seconds in dipyridyl mixtures and a 2 percent nicotine sulphate (40-percent), the latter being the more toxic. The dipyridyl mixture might in certain circumstances replace the much more costly nicotine sulphate.

GUNN, D. (1924)

1926. THE CARNATION WORM. Jour. Dept. Agr. Union So. Africa 12 (3): 225-227, illus. [Abstract in Rev. Appl. Ent. (A) 14: 232. 1926.]

For combating the tortricid moth *Ephichorista ionephela* Meyr. a spray of 1 gal. tobacco extract (nicotine = 6 - 8%) to 60 gal. of water plus 3 lb. good yellow soap was used applied as a fine mist. After its use for 4 months the pest was reduced to negligible proportions

WATANABE, T. (1925)

1927. A CONTROL METHOD FOR *HELLULA UNDALIS* FAB. (PYRALIDAE), A PEST OF VEGETABLES. Agr. and Hort. 2 (9): 987-992, [Tokoyo]. [In Japanese. Abstract in Rev. Appl. Ent. (A) 15: 641. 1927.]

Spraying the young growth with derris, nicotine sulphate, pyrethru or lead arsenate is recommended against the larvae of the above moth.

SCHØYEN, T. H. (1926)

1919. REPORT ON INSECT PESTS AND FUNGUS DISEASES OF THE FIELD AND ORCHAR IN 1918. 71 pp., illus. Christiania. [In Norwegian. Abstract in Rev Appl. Ent. (A) 7: 538-541. 1919.]

Nicotine tests against the larvae of a moth (*Incurvaria capitella* Cl.) killed only 22 percent.

MILES, H. W. (1927)

1926. LIFE HISTORY AND CONTROL OF THE PEA MOTH, *LASPEYRESIA NIGRICANA* STEPH. Bull. Chamber Hort. 3 (1): 6-9, illus. [Abstract in Rev. Appl. Ent. (A) 14: 217-218. 1926.]

In the case of peas grown for marketing green, the best results were obtained by spraying with 2 lb. calcium caseinate, 2 lb. lead arsenate powder and 10 oz. nicotine per 100 gal. water, applied on 22nd July. The use of this spray resulted in 30 percent of infested pods and 11 percent of damaged peas. The use of a spray of 10 oz. nicotine per 100 gal. water with soap sufficient to lather gave almost equally good results as 20 lb. powdered derris (16 percent damage in threshed peas).

KUWAYAMA, S. (1928)

1928. NOTES ON LASPEYRESIA GLYCINIVORELLA MATSUMURA, THE SOY BEAN POD BORER. Jour. Coll. Agr. Hokkaido Imp. Univ. 19 (5): 261-282, illus. [Abstract in Rev. Appl. Ent. (A) 17: 52. 1929.]

Among methods of control is spraying with nicotine sulphate and soap.

PADDOCK, F. B. (1929)

1912. THE SUGAR-BEET WEB-WORM (LOXOSTEGE STICTICALIS L.) Jour. Econ. Ent. 5: 436-443. [Abstract in Rev. Appl. Ent. (A) 1: 40-42. 1913.]

Tobacco decoction, 1 lb. stems to 1 gal. water, was effective in killing the larvae without damage to the leaves.

DRYENSKI, P. (1930)

1930. ON THE BIOLOGY OF L. STICTICALIS IN BULGARIA AND ITS CONTROL. Mitt Bulgarian Ent. Gesell. 5: 39-62, illus. [In Bulgarian. Abstract in Rev. Appl. Ent. (A) 18: 226-227. 1930.]

A 4-5 percent solution of barium chloride is the best insecticide for the control of Loxostege (Phlyctaenodes) sticticalis L. but if neither this nor paris green is available the spray recommended by Mokrzecki may be used. This consists of 5 pounds tobacco boiled for 1 to 2 hours in 6 gal. water to which 2 1/2 lb. soap is added after straining. This spray should be applied when it cools down to 167° F., at which temperature it does not damage the plants but kills the larvae.

GÓMEZ CLEMENTE, F. (1931)

1931. LUCERNE MOTHS. Bol. Pat. Veg. Ent. Agr. 5 (1930), no. 19-22, pp. 47-58, illus. Madrid. [In Spanish. Abstract in Rev. Appl. Ent. (A) 20: 250-251. 1932.]

In Valencia, lucerne is severely injured by Loxostege sticticalis L. and the tineid Nothris lotellus Const. The effective remedies included a spray containing 0.15 percent nicotine sulphate.

KORAB, I. I. (1932)

1931. SOME OBSERVATIONS ON THE MEADOW MOTH IN 1929. LOXOSTEGE STICTICALIS L. The Meadow Moth in 1920-1930, pt. 1, pp. 9-42, illus. Kiev. [In Russian. Abstract in Rev. Appl. Ent. (A) 19: 522. 1931.]

Sprays of soft soap (1:400), or 3 percent tobacco extract (1:10) killed all the eggs of the above moth, but are too expensive for general use.

JEPSON, F. P., ET AL. (1933)

1930. REPORTS ON INSECT PESTS IN CEYLON DURING 1929. Ceylon Dept. Agr. Tech. Rept. 1929, 25 pp. [Colombo]. [Abstract in Rev. Appl. Ent. (A) 19: 137-138. 1931.]

Sodium silicofluoride and tobacco extract were not effective against nettle grubs limacodids on tea plants.

SONAN, J. (1934)

1927. STUDIES ON THE INSECT PESTS OF THE TEA PLANT. PART II. Formosa Dept. Agr. Res. Inst. Rept. No. 29, 132 pp., illus. [In Japanese. Abstract in Rev. Appl. Ent. (A) 16: 482-483. 1928.]

Spraying with derris and soap, or nicotine sulphate and soap proved very effective against the lymantriids which infest the tea plant in Formosa.

KEMNER, N. A. (1935)

1926. *LYONETIA CLERCKELLA* L., ITS BIOLOGY AND CONTROL. Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden] No. 301 (Ent. Avdel. No. 4 59 pp., illus. [In Swedish. Abstract in Rev. Appl. Ent. (A) 14: 612. 1926.]

Nicotine sprays are of value during the vegetative period. A solution of 1 per mille nicotine kills the larvae in their mines and the pupae in their webs and does not seem to harm the parasites.

WORTHLEY, H. N. (1936)

1923. THE CONTROL OF THE SQUASH VINE BORER IN MASSACHUSETTS. Mass. Agr Expt. Sta. Bull. 218, pp. 70-80, illus. [Abstract in Rev. Appl. Ent. (A) 12: 244. 1924.]

Experiments show that nicotine sulphate at 1 to 100 kills over 97 percent of the eggs of this moth (*Melittia satyriniformis* Hb.) and at 1 to 250 kills over 90 percent.

FRIEND, R. B. (1937)

1931. THE SQUASH VINE BORER, *MELITTIA SATYRINIFORMIS* HÜBNER. Conn. Agr. Expt. Sta. Bull. 328, pp. 587-608, illus. [Abstract in Rev. Appl. Ent. (A) 19: 493-494. 1931.]

One of the insecticides recommended for the control of the above insect is nicotine sulphate (1:100) with 0.5 percent soap.

SCHINDLER, A. (1938)

1923. DAMAGE CAUSED TO MOROCCAN CROPS BY THE CATERPILLARS OF OCNOGYNA BAETICA, RAMB. VAR. MERIDIONALIS, SEITZ. Bull. Soc. Sci. Nat. maroc 3 (1-2): 21-22. [In French. Abstract in Rev. Appl. Ent. (A) 11: 356-357. 1923.]

Tobacco powder, which is easily obtained in Morocco, and also arsenicals might be used with advantage against the above caterpillars.

KAZYAKINA-VINOGRADOVA, V. N. (1939)

1932. ON THE BIOLOGY OF THE POCKET-MOTH (ORNIX GUTTEA HW.). Bull. Leningrad Inst. Controll. Fm. For. Pests, No. 3, pp. 249-258, illus. [In Russian. Abstract in Rev. Appl. Ent. (A) 21: 121. 1933.]

Measures suggested for control of this tineid (Parornix Ornix guttea Haw.) include spraying infested trees with nicotine.

MILES, H. W. (1940)

1931. ON THE GARDEN PEBBLE MOTH, PIONEA FORFICALIS L. Northwestern Nat. 6 (4): 200-207, illus. [Abstract in Rev. Appl. Ent. (A) 20: 193-194. 1932.]

When cruciferous plants newly set out are infested in Britain, a spray of soap and nicotine or one containing derris extract could be used provided that the centers of the plants are loose and open, the material being forced well into them and applied to the lower surface of the leaves. When seed beds are infested, the plants could be tied in bundles when drawn out for setting and dipped in a dilute insecticide such as nicotine and soap.

MORGAN, A. C. (1941)

1910. AN OBSERVATION UPON THE TOXIC EFFECT OF THE FOOD OF THE HOST UPON ITS PARASITES. Wash. Ent. Soc. Proc. 12 (2): 72-73.

During 3 years tobacco-horn worms (Phlegethontius sexta and P. quinquemaculata Haw.), when found feeding upon plants other than tobacco, were highly parasitized by Apanteles congregatus Say; but when they were found feeding upon tobacco plants, they were seldom parasitized. The author believes that the low parasitism was due to the toxic effect of nicotine in the tobacco.

GIBSON, A. (1942)

1919. THE GREENHOUSE LEAF-TYER (PHLYCTAENIA FERRUGALIS HBN.) Agr. Gaz. Canada 6 (7): 626-629, illus. [Abstract in Rev. Appl. Ent. (A) 7: 443. 1919.]

The following mixture applied three times at intervals of one week has proved successful: 1 av. oz. soluble sulphur, 1 fl. oz. Black Leaf 40 and 6 gal. of water. Care should be taken to spray the plants well from below at the first appearance of the pest.

WEIGEL, C. A., BROADBENT, B. M., and BUSCK, A. (1943)

1924. THE GREENHOUSE LEAF-TYER, PHLYCTAENIA RUBIGALIS (GUENNÉE). Jour. Agr. Res. 29: 137-158 , illus. [Abstract in Rev. Appl. Ent. (A) 13: 181-182. 1925.]

When it is not feasible to fumigate with hydrocyanic acid gas, persistent dusting with 5 percent nicotine sulphate dust is recommended against the moths.

WALLACE, F. N., ET AL. (1944)

1927. REPORT OF THE DIVISION OF ENTOMOLOGY. Ind. Dept. Conserv. 8th Ann. Rept., 1925-26, pp. 32-62. [Abstract in Rev. Appl. Ent. (A) 15: 403-404. 1927.]

Lights placed over shallow pans of oil as trap for the adults of the greenhouse leaf tyer (Phlyctaenia rubigalis Gn.) are also of value, particularly if used in conjunction with a slight fumigation with nicotine, the fumes of which irritate the moths so that they all take flight and are more easily attracted to the lights (p. 404).

NOUGARET, R. L. (1945)

1919. THE ACHEMON SPHINX (PHOLUS ACHEMON DRURY). Calif. Dept. Agr. Monthly Bull. 8 (10): 560-584, illus. [Abstract in Rev. Appl. Ent. (A) 8: 113-114. 1920.]

An effective remedy consists of 11 lb. lead arsenate paste with 24 lb. atomic sulphur, 1 lb. ground glue, 1 1/2 pt. Black Leaf 40 and 200 gal. water. This is most effective if applied a few days before the larvae are fully grown.

SPENCER, H., and STRONG, W. O. (1946)

1925. THE POTATO TUBER WORM. HISTORY IN VIRGINIA. Va. Truck Expt. Sta. Bull. 53, pp. 419-463, illus. [Abstract in Rev. Appl. Ent. (A) 14: 471. 1926.]

Arsenical dusts and sprays and nicotine preparations gave negative results in the field against this insect (Phthorimaea opercullella Zell.).

BRITTON, W. E. (1947)

1920. NINETEENTH REPORT OF THE STATE ENTOMOLOGIST OF CONNECTICUT FOR 1919. Conn. Agr. Expt. Sta. Bull. 218, pp. 112-208. [Abstract in Rev. Appl. Ent.(A) 8: 337-341. 1920.]

One teaspoonful of Black Leaf 40 with 1 oz. laundry soap in 1 gal. of water is effective against larvae of the green clover worm (Plathypena scabra F.).

HAWLEY, I. M. (1948)

1922. INSECTS AND OTHER ANIMAL PESTS INJURIOUS TO FIELD BEANS IN NEW YORK. Cornell Agr. Expt. Sta. Mem. 55, pp. 949-1037, illus. [Abstract in Rev. Appl. Ent. (A) 11: 395-398. 1923.]

On wax and string beans 1 gal. nicotine sulphate to 750 gal. of water with 3 lb. soap to each 50 gal. of water is safer than lead arsenate (2 - 3 lb. paste per 50 gal.) against green clover worm (Plathypena scabra F.).

DESMOULINS, A., and RANGER, M. (1949)

1928. UN ENNEMI OCCASIONEL DU CARDON. Prog. Agr.et Vitic. 90 (33): 158-160. Aug. 12. [Abstract in Rev. Appl. Ent. (A) 16: 624. 1928.]

Nicotine solution applied to well-grown larvae of Pyrameis (Vanessa) cardui L. on cardoons proved ineffectual.

MEILHAN, J. (1950)

1928. SUR LA VANESSE DU CHARDON. Rev. Zool. Agr. et Appl. 27: 190-195. 1928.

A nicotine spray, consisting of 1,500 g. nicotine per 100 l. water, will destroy the eggs as well as the larvae of butterflies (Pyrameis cardui L.) on artichokes in France.

GLOVER, P. M. (1951)

1932. DEPARTMENT OF ENTOMOLOGY. Indian Lac Res. Inst. Namkum, Ann. Rept. [Ranchi] 1931-32, pp. 14-36, illus. [Abstract in Rev. Appl. Ent. (A) 21: 130-131. 1933.]

Good results were obtained against the moth Semiothisa fidoniata Gn. on large trees with a contact spray prepared by boiling together tobacco and soft soap in water for half an hour. It appeared to be repellent to larvae and ovipositing females, and most of the eggs on sprayed leaves failed to hatch.

HOWARD, L. O., and MARLATT, C. L. (1952)

1902. THE PRINCIPAL HOUSEHOLD INSECTS OF THE UNITED STATES. U. S. Dept. Agr. Div. Ent. Bull. 4 n.s., revised ed., 131 pp., illus.

Tobacco placed among clothes will prevent the clothes moth (Tinea pellionella) from entering to deposit eggs, but has no effect on the eggs or larvae already on the clothes, and is of value only so long as the odor lasts (p. 68).

BENEDICT, R. C. (1953)

1917. AN OUTLINE OF THE LIFE HISTORY OF THE CLOTHES MOTH *TINEOLA BISELLIELLA*. Science 46 (1193): 464-466. [Abstract in Rev. Appl. Ent. 6: 48. 1918.]

Tobacco, used as a repellent, is ineffective against the clothes moth at any stage.

FISHER, R. C. (1954)

1924. THE LIFE HISTORY AND HABITS OF *TORTRIX PRONUBANA* HB. WITH SPECIAL REFERENCE TO THE LARVAL AND PUPAL STAGES. Ann. Appl. Biol. 11 (3-4): 395-447, illus. [Abstract in Rev. Appl. Ent. (A) 12: 560-561. 1924.

Spraying with nicotine or lead arsenate is effective against this insect under glass if applied before and immediately after the egg hatch, that is, before the larvae begin to spin their webs.

COLIZZA, C. (1955)

1927. THE CARNATION CATERPILLAR. Boll. Lab. Zool. Gen.Agr, R. Scuola Sup. Agr. 20: 42-59, illus. [Abstract in Rev. Appl. Ent. (A) 15: 277-278. 1927.]

A nicotine or lead arsenate spray applied about the time that th larvae hatch is an excellent remedy against *Tortrix pronubana* Hb.

GIBSON, A. (1956)

1924. THE OCCURRENCE OF THE TORTRICID *CACOECIA ROSANA* L. IN CANADA. Jour. Econ. Ent. 17: 51-54. [Abstract in Rev. Appl. Ent. (A) 12: 169-170. 1924.]

The spray recommended against the larvae of *Tortrix* (*Cacoecia*) *rosana* L. consists of 1 oz. nicotine sulphate (40-percent), 8 oz. fish-oil soap, 2 oz. lead arsenate powder and 3 gal. water to be applied as often as necessary, particularly against the young larvae.

FEYTAUD, J. (1957)

1913. LA VANESSE DU CHARDON ET DE L'ARTICHAUT. Bull. Soc. Étude et V Zool. Agr. 12 (4): 109-114, illus.

Against *Vanessa pyrameis* on artichokes Boyer obtained good resul in 1906 with a nicotine spray on a large scale.

OELSCHIG, A. C. (1958)

1919. THE SOUTHERN FERN WORM. Florists' Rev. 44 (1137): 19.

The Florida fern caterpillar can be cleaned up by simply sprayi with nicotine extract to which fish-oil soap is added. Dissolve 7 or 8 lb. of soap in a barrel of water, then use the nicotine according to directions on the can, and dilute with more water (1 to 4).

AMMON, E. VON, and SZOMBATHY, K. (1959)

1927. INSECTICIDES. British patent 294,646. July 29. [Abstract in Chem. Abs. 23: 1985. 1929.]

Lupanine used instead of nicotine or with nicotine as a plant wash may be rendered effective against caterpillars by admixture with amyl, ethyl, or methyl alcohol. Insecticides, containing nicotine and a wax solvent such as resinic acid or its salts, destroy _Schizoneura lanigera_ which are protected by a waxy coating.

ISACHENKO, V. B., and GORITZKAYA, O. V. (1960)

1931. SOME DATA OF TOXICOLOGICAL ANALYSIS OF THE PYRETHRUM. Bull. Plant Protect. 3 (1): 165-174, illus. [In Russian with a summary in English. Abstract in Rev. Appl. Ent. (A) 20: 198-199. 1932.]

In spraying tests, an alcoholic extract of _Chrysanthemum cinerariaefolium_ at 1 to 10 and 1 to 100 proved very much more toxic to Lepidopterous larvae than nicotine sulphate at 0.1 and 0.05 percent concentrations.

WOLCOTT, G. N. (1961)

1933. THE LIMA BEAN POD-BORER CATERPILLAR OF PUERTO RICO. Jour. Dept. Agr. Puerto Rico 17 (3): 241-255, illus. [Abstract in Rev. Appl. Ent. (A) 22: 153-154. 1934.]

Experiments with insecticides, including nicotine, failed to reveal any promising method of control.

O. MISCELLANEOUS PESTS, 1885-1934

1. Springtails and _Lepisma_, 1921-1933

SYMES, C. B., and CHORLEY, J. K. (1962)

1921. INSECT PESTS OF MUSHROOMS. Fruit Grower, Fruiterer, Florist and Market Gardning., [London] 51(1313-1315, 1319-1320): 142-145, 188-190, 234-236, 454-456, 494-496, illus. [Abstract in Rev. Appl. Ent. 10(A): 47-49. 1922.]

A species of Collembola (_Achorutes armatus_ Nic.) is abundant on all mushroom beds. Spraying the beds with nicotine or lysol before the mushrooms appear is suggested (p. 49).

BLUNCK, H. (1963)

1933. _BOURLETIELLA SIGNATA_ NIC. AS A PEST OF GHERKINS. Anz. Schädlngsk. 9(1): 9-12, illus. [In German. Abstract in Rev. Appl. Ent. (A) 21: 139. 1933.]

The leaves of gherkin seedlings in Schleswig-Holstein were injured by the above springtail. In one serious case it was completely controlled by a single application of a spray containing 0.5 percent crude nicotine.

RIPPER, W. (1964)

1930. MUSHROOM COLLEMBOLA. THE BIOLOGY AND CONTROL OF HYPOGASTRURA MANUBRIALIS TULLBG. Ztschr. Angew. Ent. 16(2): 546-584, illus. [In German. Abstract in Rev. Appl. Ent. (A) 18: 698-699. 1930.]

Tobacco dust was found ineffective against mushroom Collembola.

LEA, A. M. (1965)

1922. THE LUCERNE FLEA (SMYNTHURUS VIRIDIS L.) Jour. Dept. Agr. So. Aust. 26(5): 423-426, illus. [Abstract in Rev. Appl. Ent. (A) 11: 153. 1923.]

Sprays of tobacco should be useful.

NEWMAN, L. J. (1966)

1927. SEASONABLE HINTS. Jour. Dept. Agr. W. Aust. 4(1): 78-82, illus. [Abstract in Rev. Appl. Ent. (A) 15: 350. 1927.]

Control measures against the lucerne flea (Smynthurus viridis L.) for use on limited areas, which must be applied promptly on the first appearance of the pest include a spray of 1 pt. 40-percent nicotine sulphate, 4 lb. soap dissolved by boiling and 80 imperial gal. water.

MALENOTTI, E. (1967)

1928. SMYNTHURUS VIRIDIS LUBB. INJURIOUS TO WHEAT. Atti Accad. Agr. Sci. e Lett. Verona (5) 5, 11 pp. [In Italian. Abstract in Rev. Appl. Ent. (A) 16: 595-596. 1928.]

An infestation on wheat was controlled by spraying with either a 1 1/2 percent solution of lead arsenate paste or with a 2 percent solution of carbolic tobacco extract.

MOORE, E. S., and SMITH, A. J. (1968)

1933. PESTS AND DISEASES IN TOBACCO SEED-BEDS. Fmg. So. Africa. Reprint no. 46, 4 pp., illus. [Abstract in Rev. Appl. Ent. (A) 22-49. 1934.]

Control measures advised include spraying with 6 to 8 percent tobacco extract (1:80) against Collembola and (with the addition of 3 to 4 oz. soap to 4 gal. of the mixture) against aleurodids.

BROOKS, A. J. (1969)

1925. WORK CONNECTED WITH INSECT AND FUNGUS PESTS AND THEIR CONTROL. Gambia. Ann. Rept. Dept. Agr. 1924, pp. 13-18. [Abstract in Rev. Appl. Ent. (A) 13: 554. 1925.]

Semiweekly fumigation with nicotine for the first month followed by weekly fumigations as long as necessary is advised for the control of silverfish, Lepisma.

2. Orthoptera, Earwigs, and Termites, 1909-1930

SCHROEDER, J. (1970)

1909. VERSUCHE ZUR BEKÄMPFUNG DER WANDERHEUSCHRECKE MIT CHEMISCHEN PRODUKTEN. Ztschr. Pflanzenkrankheiten 19: 1-13, illus.

A portion of a large swarm of the migratory locust (wingless young) was put in an enclosure in Uruguay. The insects were sprayed with a solution consisting of 5 l. tobacco extract (10 percent nicotine) and 100 l. water. Within 12 hours 40 percent of them were dead. Another portion of the grasshoppers was sprayed with the same solution to which had been added 2 kg. molasses. Within 12 hours 41 percent of them were dead (pp. 10-11).

ROBERT, J. (1971)

1914. EPHIPPIGER, SPP. INJURIOUS TO THE VINE. Soc. Étude Vulg. Zool. Agr. Bull. Bordeaux 13(7): 114-116, illus. [In French. Abstract in Rev. Appl. Ent. (A) 3: 188. 1915.]

Spraying with nicotine, or dusting with nicotined sulphur, may drive grasshoppers away, but the effect is usually temporary.

LUNARDONI, A. (1972)

1915. ON THE CONTROL OF GRASSHOPPERS. Boll. Minist. di Agr., Industr. e Commercio Ser. B. Anno 14(v.1): 258-270. [In Italian.]

A 15 percent solution of phenicated tobacco extract had scarcely any effect upon the grasshoppers treated (p. 264.)

LARRIMER, W. H. (1973)

1921. GRASSHOPPER AND CRICKET REPELLENTS. Jour. Econ. Ent. 14: 259-263.

Black Leaf 40 (1 tablespoon to 1 pt. water) was mixed with bran bait and then offered to the insects. Of the 14 repellents tested it was fourth in efficiency, the three more effective ones being copper sulphate, kerosene, and auto oil (pp. 261-263).

SMITH. (1974)

1921. FIGHT AGAINST APHIDS. Rev. Hortic. Algérie, Algiers 25(3): 60. [In French. Abstract in Rev. Appl. Ent. (A) 10: 170. 1922.]

Aphids are killed in a few minutes by the application of a dust consisting of 100 parts of powdered lime to 30 parts of tobacco powder. This mixture is also very effective against young grasshoppers if applied within 2 hours after hatching.

SMITH, L. M. (1975)

1930. THE SNOWY TREE CRICKET AND OTHER INSECTS INJURIOUS TO RASPBERRIE Calif. Agr. Expt. Sta. Bull. 505, 38 pp., illus. [Abstract in Rev. Appl. Ent. (A) 19: 318-319. 1931.]

Calcium cyanide and nicotine dusts were tried against the snowy tree cricket (Oecanthus niveus De G.), but were finally abandoned owing to high cost, difficulty of handling, and great variation in toxicity.

ZACHER, F. (1976)

1927. DIE VORRATS-, SPEICHER- UND MATERIALSCHÄDLINGE UND IHRE BEKÄMPFU 366 pp., illus. Berlin.

Nicotine vapors are ineffective against cockroaches in kitchens, cellars, and store rooms (p. 48). The following spray solution is reco mended: 2 kg. soft soap, 1 l. tobacco extract (8 to 10 percent nicotine and 100 l. water.

JONES, D. W. (1977)

1917. THE EUROPEAN EARWIG AND ITS CONTROL. U. S. Dept. Agr. Bull. 566 12 pp., illus. [Abstract in Rev. Appl. Ent. (A) 5: 444-445. 1917.]

If the earwig's (Forficula auricularia L.) attacks persist durin the summer a contact spray of nicotine, soft soap, and water should be used over the plants every three nights after July 1 until the pest is controlled.

THOMSEN, F. (1978)

1909. NOTES ON TERMITES. Transvaal Agr. Jour. 7: 512-520, illus.

Tobacco extracts of all sorts seem worthless for the purpose of preventing termite attacks. None of them contain more than an average 8 percent nicotine and this is easily washed out of the wood by water i the soil, leaving the wood entirely unprotected (p. 516).

MORRILL, A. W. (1979)

1919. REPORT OF THE ENTOMOLOGIST. NOTES ON IMPORTANT INSECTS OF THE YEAR. Ninth Ann. Rept. Ariz. Comn. Agr. and Hort. 1917. pp. 15-61, i [Abstract in Rev. Appl. Ent. (A) 7: 204-206. 1919.]

Good results against thrips (Frankliniella morrilli Morg.) on apricots were obtained by spraying with a nicotine soap solution under a pressure of at least 150 lbs. Termites (Amitermes tubiformans Buckley) damaging citrus were successfully controlled by scooping out a basin round the base of each tree and pouring into it 1/2 pt. Black Leaf 40 diluted 1 to 500.

FULLER, C. (1980)

1924. WHITE ANT EXPERIMENTS: TESTS OF THE RESISTANCY OF TIMBERS. Union of So. Africa Dept. Agr. Ent. Mem. No. 2, pp. 81-104, illus.

Tobacco extract was found unsatisfactory for impregnating timber in South Africa for the purpose of preventing termite attacks (p. 102).

BHASIN, H. D. (1981)

1926. ANNUAL REPORT OF THE ENTOMOLOGIST TO GOVERNMENT, PUNJAB, LYALLPUR, FOR THE YEAR 1924-1925. Rept. Operations Dept. Agr. Punjab 1925 I, Part II, pp. 69-121. [Abstract in Chem. Abs. 21: 2754. 1927.]

Extracts of tobacco were slightly repellent to white ants.

3. Species of Insects not Named, 1903-1934

BINNENTHAL, F. R. von. (1982)

1903. DIE ROSENSCHÄDLINGE AUS DEM TIERREICHE, DEREN WIRKSAME ABWEHR UND BEKÄMPFUNG. Stuttgart, 392 pp., illus.

The author quotes the formula recommended by the Central Horticultural Society of the lower Seine, as follows: 50 g. hepar sulfuris, 100 g. soft soap, 200 g. tobacco extract, 250 g. methyl alcohol, and 10 l. water (p. 62). This sulphur mixture is meant particularly for mites, red spider, and coccids, and it is to be applied with a brush.

Nessler's solution, which is meant for any insect infesting rose bushes, consists of 6 kg. tobacco extract, 4 kg. soft soap, 5 l. wood alcohol, 20 l. alcohol, and 100 l. water (p. 38).

Roses infested with aphids may be sprayed with 1 to 1.5 l. tobacco extract to 100 l. water. If the aphids are covered with a waxy exudation, soap should be added (p. 38).

STÖRMER, K. (1983)

1903. DIE DUFOURSCHE LÖSUNG UND IHRE ANWENDBARKHEIT ZUR BEKÄMPFUNG VON PFLANZENSCHÄDLINGEN. Prakt. Blätter fur Pflanzenbau und Pflanzenschutz 1: 133-145. 1903.

Against aphids on hops a spray solution containing 1 percent tobacco extract and 1.5 percent soft soap solution was very good (p. 14

STRUHALLA, J. (1984)

1903. CONTROLLING APHIDS. Prakt. Ratgeber im Obst- und Gartenbau 18: 256, illus. 1903. [In German.]

One pound of soap is dissolved in 10 l. water and the contents of 2 packages of smoking tobacco is soaked in water and the decoction is added to the soap solution and thoroughly mixed. The infested potted plants are dipped upside down into this solution and allowed to dry, and later they are washed with clean water.

INDA, J. R. (1985)

1906. TOBACCO AS AN INSECTICIDE. Comision de Parasitologia Agricola, Mexico. Circ. No. 44, pp. 1-5, illus. [In Spanish.]

In the laboratory of the above Commission tobacco juices have been tried against soft insects, larvae, and bugs. They are sold in the city of Mexico and are labeled 46-47° Baumé. They gave good results when applied in dilutions of 5 parts of juice to 100 parts of water and the insects died within 10 to 20 minutes after the applicatio of the spray.

R, N.D.L. (1986)

1908. NOTICE SUR LE JUS DE TABAC. Revue Horticole Tunisienne 7: 192.

The following spray mixture is the formula of the Tunisian Government for use in North Africa: 1 l. tobacco extract, 1 tablespoonful sodium carbonate, 10 g. black soap, 1 tablespoonful methyl alcohol, and 5 l. water.

SARGEANT, F. P. (1987)

1909. FUNGICIDES, INSECTICIDES, AND VERMIN KILLERS. Merck's Rept. 18(11): 294-296.

Nicotine is used as an insecticide, either emulsified with soap as a spray or in alcoholic solution with camphor and various volatile oils as a fumigant. Some of the nicotine of commerce is adulterated with pyridine. For use as a fumigant the alkaloid should be pure. Nicotine has also been used for destroying ants and as a sheep dip (p. 295).

Tobacco, denatured in bond, is used in powder as an insecticide. It is an ingredient in most fumigating powders. Infusions are also used for the same purpose in the form of sprays and washes. Tobacco is also used in the manufacture of sheep dip (p. 296).

McCLINTOCK, C. T., HAMILTON, H. C., and LOWE, F. B. (1988)

1911. A FURTHER CONTRIBUTION TO OUR KNOWLEDGE OF INSECTICIDES. Jour. Amer. Pub. Health Assoc. 1(4): 227-238, illus. (Old Ser. Vol. 7.)

In the laboratory a specially devised fumigating apparatus was used to obtain comparative results from many substances. The fumes from an 80 percent solution of nicotine were tested against the bedbug, cockroach, housefly, clothes moth, and mosquito. The results given are in terms of the coefficient of efficiency of sulphur dioxide on bed bugs (p. 233).

VINCENS, J. (1989)

1911. LA NICOTINE ET LES VITICULTEURS. Rev. Vitic. 35(909): 589-590.

Tests were made in France on grape shoots bearing very tender leaves. The shoots were covered with various concentrations ranging from 120 to 200 g. nicotine per 100 l. water. Concentrations up to 140 g. per 100 l. had no burning effect, but higher ones did burn slightly.

GAVILAN, J. (1990)

1913. POWERFUL INSECTICIDE. La Informacion Agricola 3: 127. [In Spanish.]

Against leaf-eating insects on fruit trees the following spray mixture is recommended in Spain: 100 g. tobacco juice, 50 g. common white soap, 10 g. sodium carbonate, and 50 g. methyl alcohol. The soap is dissolved in 5 l. water.

MORSTATT, H. (1991)

1914. THE MOST IMPORTANT CHEMICAL METHODS OF PROTECTING PLANTS. Der Pflanzer. 10(3): 144-149. [Abstract in Rev. Appl. Ent. (A) 2: 447-448. 1914.]

Tobacco mixture is used against aphids, scale insects, leaf-eating beetles and their larvae, bugs, etc.; 3 or 4 dried tobacco leaves and stems are cut up and boiled in 10 gal. water and left standing for 24 hours; 10 to 20 lb. soap are dissolved in 4 gal. hot water and mixed with the tobacco solution; the whole being diluted with 100 gal. water.

STRATFORD, G. (1992)

1914. LEAF-ROLLER CATERPILLAR. Jour. Dept. Agr. New Zealand 9: 338-339, illus.

Another summer spray that appears to have done exceptionally good work where used is lime-sulphur 1/2 gal., tobacco extract 1/3 gal., and water 60 gal. Although this spray is chiefly used to combat the red spider, it is very effective on the leaf-roller caterpillar in New Zealand.

GILLETTE, C. P., and LIST, G. M. (1993)

1915. INSECTS AND INSECTICIDES. Colo. Agr. Expt. Sta. Bull. 210:1-55 illus.

Tobacco dust is used against flea-beetles and woolly aphids on the roots of apple trees (p. 49).

The tobacco extracts on the market include Black Leaf 40 and Nicofume, both of which contain about 40 percent of nicotine. Tobacco decoction is also briefly discussed (p. 49).

Tobacco extracts are recommended as remedies for the following insects: Apple leafhopper (p. 15), green apple aphid and rosy apple aphid (p. 16), clover mite (p. 17), red spider (p. 20), oyster-shell scale, scurvy scale, and woolly aphid (p. 23), green peach aphid, black peach aphid, green plum aphid, and pear slug (p. 28), currant plant louse (p. 33), cottony maple scale and elm scale (p. 37), other plant lice and sawfly (p. 40).

LEFROY, H. M. (1994)

1915. INSECTICIDES. Ann. Appl. Biol. 1(304): 230-298. [Abstract in Rev. Appl. Ent. (A) 3: 283-285. 1915.]

From the literature the writer finds nicotine in general use as a panacea for all pests, as a stomach poison for caterpillars, as a contact poison for apple sucker, aphids, etc. One percent nicotine in water killed no mealworms dipped in it. "It would almost appear that most insects can only be reached with an insecticide through the spiracles."

GOSSARD, H. A., and GREEN, W. J. (1995)

1916. SPRAYING PROGRAMS FOR THE SMALL HOME ORCHARD AND FRUIT-GARDEN. Ohio Agr. Expt. Sta. Monthly Bull. 1(4): 103-107. [Abstract in Rev. Appl. Ent. (A) 4: 364. 1916.]

For cherry the third spray should be 3 lb. paste lead arsenate to 50 gal. water, plus nicotine sulphate (1:500) and 2 lb. soap applied just after the blossoms fall; and the fourth spray should be the same without the soap a week later.

Gooseberry and currant bushes should receive as their third spra bordeaux mixture 4-4-50, lead arsenate 3 lb. paste to 50 gal. and nicot sulphate (1:700) when the flowers are opening.

SMITH, L. B. (1996)

1916. RELATIONSHIP BETWEEN THE WETTING POWER EFFICIENCY OF NICOTINE-SULPHATE AND FISH-OIL-SOAP SPRAYS. Jour. Agr. Research 7: 389-399, illus. [Abstract in Rev. Appl. Ent. (A) 5: 104-105. 1917.]

The optimum efficiency of sprays containing nicotine sulphate and fish-oil soap was reached with a definite degree of concentration, while solutions of greater or less concentration were less effective as insecticides. The addition of nicotine sulphate to fish-oil soap solutions decidedly increases their value as insecticides, while the efficiency of nicotine sprays is also increased by the addition of soap, but when more than 4 lb. of soap were used with 10 oz. of nicotine sulphate to 50 gal. of water, there was a loss of both wetting power and efficiency. A chemical change probably takes place when a certain concentration is reached. It is evident from the relative efficiency of the sprays that this chemical reaction affects the soap and not the active nicotine sulphate.

The most satisfactory results were obtained with formulae containing 5 lb. of soap and 6-1/2 to 8-3/4 oz. of nicotine sulphate to 50 gal. of water. When more than 8-3/4 oz. of nicotine was added, there was a loss in both wetting power and efficiency.

V., S. (1997)

1916. ON THE REPLACEMENT OF QUASSIA BY TOBACCO. Fruit Growing, Petrograd, 27(8-9): 378-379. [In Russian. Abstract in Rev. Appl. Ent. (A) 4: 495. 1916.]

As a substitute for quassia decoction and soap, tobacco and soap may be used, 1 lb. tobacco leaves being boiled in 3 gal. of water to which 1/2 lb. of soap is subsequently added. The tobacco extract may be preserved by adding 1 g. of salicyclic acid to each pt. For use, 5 to 10 lb. of the extract is dissolved in 30 gal. of water, 5 lb. of soap being added.

ANONYMOUS (1998)

1917. LA NICOTIANA. Rivista di Agricoltura 23: 664.

The following spray mixture is recommended in Portugal: 1 to 2 g. pure nicotine, 200 g. sodium carbonate, 1000g. black soap, 1 l. denatured alcohol, and 100 l. water.

BENTLEY, G. M. (1999)

1917. SUGGESTIONS FOR THE CONTROL OF INJURIOUS INSECTS AND PLANT DISEASES. Tenn. Agr. Expt. Sta. Bull. 117, pp. 111-123, illus.

Directions are given for the preparation of homemade tobacco solution. Factory-made tobacco solutions are sold under various trade names and contain 10, 20, 30, and 40 percent of nicotine by weight. Tobacco, dust, snuff, or warehouse sweeping can be used with partial success against the root aphid (p. 119).

Nikoteen is used for fumigation. Put 1/7 oz. of it in 5 oz. water and place this mixture upon a hot steam pipe and let it vaporize at night. This amount is sufficient for a space of 1,000 cu. ft. (p. 121).

FRYER, J. C. F. (2000)

1917. INSECT PESTS OF BASKET WILLOWS. Jour. Board Agr. London 24 (8): 844-852, illus. [Abstract in Rev. Appl. Ent. (A) 6: 41-42. 1918.]

A nicotine soap solution has been found efficient against beetles on willows, and this is also the best contact insecticide for aphids and destroys to some extent the moth caterpillars in the shoots.

SANDERS, G. E. (2001)

1918. APPLE SPRAYING, Canadian Horticulturist 41(1): 1-3. [Abstract in Rev. Appl. Ent. (A) 6: 162. 1918.]

Nicotine sulphate can be used with any of the fungicides or poisons with perfect safety, but it is more efficient with sodium sulphide solutions than with lime-sulphur or bordeaux mixture.

SCOTT, E. W., ABBOTT, W. S., and DUDLEY, JR. J. E. (2002)

1918. RESULTS OF EXPERIMENTS WITH MISCELLANEOUS SUBSTANCES AGAINST BEDBUGS, COCKROACHES, CLOTHES MOTHS, AND CARPET BEETLES. U. S. Dept. Agr. Bull. 707, 36 pp. [Abstract in Rev. Appl. Ent. (B) 6: 240. 1918. Also (A) 6: 531-533. 1918.]

Nicotine was effective, but tobacco powders, containing as much as 5.26 percent of nicotine had little or no value on bedbugs and cockroaches. Fumigation with nicotine at the rate of 8 oz. of 40 percent nicotine sulphate to 1,000 cu. ft. was ineffective against cockroaches. Various tobacco extracts used at reasonable strengths were valueless against clothes moths. Nicotine solutions and tobacco powders were of no practical value against carpet beetles.

GAVILÁN, J. (2003)

1919. TOBACCO POWDER AS INSECTICIDE. Inform. Agr. [Madrid] 9: 134. [In Spanish.]

Tobacco dust is recommended in Spain as an effective insecticide and preferable to tobacco juice; however, its cost seems to make it prohibitive in Spain.

GILBERT, W. W., and POPENOE, C. H. (2004)

1919. DISEASES AND INSECTS OF THE HOME GARDEN. U. S. Dept. Agr. Circ. 35: 1-31, illus.

The preparation of nicotine-sulphate sprays is briefly described (p. 29), and these sprays are recommended as remedies for the following insects: Bean aphid (p. 7), plant-lice (p. 11), melon aphid and common squash bug (p. 17), onion thrips (p. 19), and pea aphid (p. 21).

HERRICK, G. W. (2005)

1920. INSECTS OF ECONOMIC IMPORTANCE. 172 pp. New York.

Tobacco dust is often used against plant lice, animal lice, and ticks. Black Leaf 40 is also briefly discussed by referring to the literature (pp.19-29).

Under fumigating substances, tobacco papers are briefly described. Paper soaked in tobacco extract is sold for fumigation purposes in greenhouses. These papers will burn when lighted and are much more convenient to use in houses than tobacco stems (p. 28).

HOLMES, G. K. (2006)

1920. THREE CENTURIES OF TOBACCO. U. S. Dept. Agr. Yearbook for 1919, pp. 151-175.

This is a popular account of the production, geographic distribution, exports and imports, and various other phases of tobacco.

After enumerating the various uses of tobacco, the author says that it was long ago learned that a decoction of stems or leaves would rid plants of insects and domestic animals of external parasites, if the animals were dipped in it, and that the smoke would expel insects from plants (p. 165).

ANONYMOUS (2007)

1921. HERSTELLUNG VON TABAKBRUHE AUS TABAKSTAUB. Landw. -bakteriol. and Pflanzenschutzstation, Vienna. [Abstract in Rev. Appl. Ent. (A) 10: 384. 1922.]

To prepare a spray containing about 1 percent of tobacco extract, 2 lb. of tobacco dust is soaked, with repeated stirring, in 5 imperial gal. water and then allowed to settle. The liquid is then filtered through linen and is ready for immediate use. The addition of 1 part lysol to 20,000 of the liquid acts as a preservative. Wetting power is enhanced by adding soft soap or lysol prior to spraying.

ALLEN, W. J. (2008)

1921. COMBINED SPRAYS. Agr. Gaz. New South Wales, 32(8): 559. [Abstract in Rev. Appl. Ent. (A) 9: 564. 1921.]

In making combined sprays it is essential that the quantities are correct. To make a spray of 100 gal. of lead arsenate and nicotine solution at the rate of 1 lb. of arsenate to 25 gal. of water and concentrated nicotine solution 1 pt. to 100 gal. of water, the best way is to mix the 4 lb. of lead arsenate in 95 gal. of water to which the pint of nicotine concentrate mixed with 4 gal. 7 pt. of water should be added.

BRITTON, W. E., and CLINTON, G. P. (2009)

1921. SPRAY CALENDAR. Conn. Agr. Expt. Sta. Bull. 224, pp. 67-110.

Under "Directions for preparing insecticides and fungicides" the following is said regarding nicotine solution: "1/2 - 3/4 pt. in 50 gal. water. Dissolve a 1-inch cube of laundry soap and add for a spreader. Several solutions are now sold containing 40% or more of nicotine. Excellent for killing aphids and other sucking insects." Nicotine is recommended for the control of leafhoppers, tarnished plant bug and green and rosy aphids on apple, cabbage aphid, cherry aphid, currant aphid, 4-lined leaf bug and scurfy scale on cucumbers, cyclamen leafmite, euonymus scale, hemispherical scale on fern, aphid on lily, woolly maple leaf-scale, melon aphid, maple aphids nasturtium aphid, onion thrips, scales on palm, pear psylla, pear thrip false tarnished plant bug, red aphids on phlox, plum aphids, aphids on poppy, rhododendron lace bug, rose slug, leafhopper, rose scale and aphid on raspberry, leaf mites on snapdragon, aphids on spiraea, spruce gall aphid, aphids on snowball, strawberry root aphid, strawberry white fly, and aphids on willow.

ANONYMOUS (2010)

1922. EL JUGO DEL TABACO COMO INSECTICIDA. Inform. Agr. [Madrid] 12(277): 495-496.

In Spain the following mixtures are recommended for spraying: 8 l. of tobacco juice (20 percent nicotine), 2 kg. copper sulphate, 4 kg. lime, and 100 l. water; or 8 l. tobacco juice, 500 g. calcium oxichloride, and 100 l. water.

BRITTON, W. E., ZAPPE, M. P., and STODDARD, E. M. (2011)

1922. EXPERIMENTS IN DUSTING VERSUS SPRAYING ON APPLES AND PEACHES IN CONNECTICUT IN 1921. Conn. Agr. Expt. Sta. Bull. 235, pp. 209-22 [Abstract in Rev. Appl. Ent. (A) 10: 335. 1922.]

The dusts used included sulphur-lead-nicotine. The liquid spray contained liquid lime sulphur, lead arsenate and nicotine sulphate. In the apple orchards the chief pests were codling moth, plum curculio, apple maggot, false apple redbug and aphids as well as various chewing insects. In nearly all cases the best apples were obtained from the sprayed plots.

MELANDER, A. L. (2012)

1922. DIVISION OF ENTOMOLOGY. 32d Ann. Rept. Washington Agr. Expt. Sta. 1921-1922. Bull. 175, pp. 21-25. [Abstract in Rev. Appl. Ent. (A) 12: 238-239. 1924.]

Treatment against subterranean insects was tried with ground tobacco, nicotine solution, calcium cyanide, and other materials, but in no case were any long-range effects observed, dead insects being found only within a foot or so of the point of administration.

RAMSAY, A. A. (2013)

1922. TWO INVESTIGATIONS IN RELATION TO SPRAYS. Agr. Gaz. N. S. Wales, 33 (7): 513-514. [Abstract in Rev. Appl. Ent. (A) 11: 204. 1923.]

A description is given of tests in which two home-made tobacco washes were used. One consisted of 10 lb. waste tobacco, 5 oz. washing soda, and 30 gal. water, and the other of tobacco waste and water only. There was little advantage in using washing soda in the preparation. Also, no harmful compounds were formed in a mixture of bordeaux mixture, lead arsenate, and tobacco.

ANONYMOUS (2014)

1923. ANWENDUNG UND WIRKUNG WERTVOLLER BEKÄMPFUNGSMITTEL. Stschr. Für Obst-, Wein und Gartenbaw [Dresden] 49(6): 44.

Against aphids, flea beetles, and leafhoppers on fruit trees in Germany, the following formula is recommended: 1 l. tobacco extract, 1/2 lb. soft soap, and 100 l. water.

ANDERSON, O. G., and ROTH, F. C. (2015)

INSECTICIDES AND FUNGICIDES SPRAYING AND DUSTING EQUIPMENT. New York, 349 pp., illus.

Directions for the preparation of home-made tobacco spray and tobacco dust (pp. 29-30) are given, and those for the preparation of sprays from 40-percent nicotine sulphate and nicotine oleate (pp. 31-34) are also given.

Under "Fumigation with tobacco Products" (pp. 127-128) it is stated that it is better to use the standard volatile or free nicotine preparations as "Nicofume" or "Nikoteen" liquid or "Nicoticide" papers. Directions are given as to how to use tobacco stems, nicotine liquid, nicotine papers, and tobacco dust.

Nicotine dusts (pp. 289-293) are also discussed.

DE ONG, E. R. (2016)

1923. THE RELATION BETWEEN THE VOLATILITY AND TOXICITY OF NICOTINE IN SPRAYS AND DUSTS. Jour. Econ. Ent. 16: 486-493. [Abstract in Rev. Appl. Ent. (A) 12: 80. 1924.]

The toxicity of nicotine solutions varies in proportion to their conversion from the salt form to the free alkaloid. The volatilization curve of nicotine is almost an exact parallel of the curve of toxicity both in fumigation and spraying. For 200 gal. of a 1 to 800 solution of nicotine sulphate 6 3/4 oz. of lime would be required. If soap is used as a spreader 3 oz. of sodium hydroxide or 4 oz. of sodium carbonate should be added.

RAMSAY, A. A. (2017)

1923. A HOME-MADE TOBACCO WASH FOR COMBINED SPRAYS. Agr. Gazette New South Wales 34(1): 58-60.

A home-made tobacco wash was prepared to take the place of "Black Leaf 40". Hitherto the home-made tobacco extracts, when used alone, have been satisfactory, but when combined with other sprays, trouble has arisen. A home-made infusion, prepared by using the following formula, should not be heated, and it combines with lime-sulphur without any change taking place: 2 lb. waste tobacco (dust), 3 gal. cold water, and 7 oz. quicklime. Other details are also given.

Against leaf-eating and scale insects, and aphids and mites on deciduous fruit trees in Australia the following treble-purpose spray is recommended: Lime-sulphur (winter strength) 1 to 10, home-made tobacco wash (1 lb. tobacco waste to 3 gal. water), and lead arsenate 2 lb. to 50 gal. water.

WARDLE, R. A., and BUCKLE, P. (2018)

1923. THE PRINCIPLES OF INSECT CONTROL. New York, pp. 16 and 295, illus.

Various nicotine preparations, including nicotine sulphate, tobacco stalks and leaves, tobacco juice, nicotine extract, Black Leaf, Black Leaf 40, and Nico-fume, are briefly discussed, and a few referenc are cited (pp. 98-101). Combination insecticides (pp. 115-117), dips and dressings (pp. 118-121), sulphur dips with tobacco infusion (pp. 12 129), nicotine dips (p. 129), and fumigants (pp. 145, 158-159), all of which deal with nicotine, are briefly described.

In regard to the dips and dressings, tobacco infusion is one of the dressings to combat biting lice on horses. A French remedy against demodectic mange includes a titrated nicotine extract.

Sulphur dips, meant to cure sheep-scab, are of four kinds, the sulphur being combined with lime, caustic soda, alkaline carbonate, and tobacco. The nicotine dips may be prepared by using either 40 percent nicotine solution or tobacco infusion. Nicotine, when used as a fumiga is often combined with sawdust, moulded into cones, and then slowly bur In France, trees covered with bag tents, have been fumigated as follows:

A ball of wood shavings about 8 in. in diameter is soaked in 3.5 to 5 oz. crude tobacco juice, and suspended in a wire basket in a cover tree with a piece of tow to act as a wick. The tow is ignited and a 10 minutes' exposure is allowed.

DE ONG, E. R. (2019)

1924. THE RELATION BETWEEN VOLATILITY AND TOXICITY OF NICOTINE. Scien 60(1540): 15-16.

Recent studies of nicotine as an insecticide have shown that the toxicity curve of nicotine in solutions is almost an exact parallel of its volatility curve. Levorotatory nicotine (free nicotine) is volatile and more toxic than the non-volatile dextrorotatory form (nicotine salts). Reduced efficiency then may result from two reasons: (a) the use of non-volatile nicotine salts, such as nicotine sulphate with insufficient alkali to free the alkaloid from the combining acid; (b) the volatilization or oxidation of nicotine from ground tobacco which is being used as a vermifuge.

The same correlation between volatility and toxicity was noted in dust mixtures.

FULMEK, L. (2020)

1924(?) NOTES ON THE APPLICATION OF INSECTICIDES AND FUNGICIDES TO DELI TOBACCO. Deli Proefst. Vlugsohr. 29, 4 pp. [Abstract in Rev. Appl. Ent. (A) 13:223. 1925.]

The contact insecticides used in Deli, Sumatra, against tobacco pests include kerosene-soap emulsion, nicotine, and derris. The addition of 0.3 to 0.5 percent soap to solutions of the last two is advised.

LEES, A. H. (2021)

1924. EGG-KILLING WASHES. Jour. Pomology and Hort. Sci. 3(4):174-178. [Abstract in Rev. Appl. Ent. (A) 12:252-253. 1924.]

Combinations of caustic soda and nicotine had strong killing power is applied just before hatching but were useless at an earlier date.

BOURCART, E. (2022)

1925. INSECTICIDES, FUNGICIDES, AND WEED KILLERS. London, 2d Ed., pp. XII, 431, illus.

This translation from the French gives a fairly good view of nicotine as an insecticide (pp. 394-404). The green leaves of Nicotiana tabacum and N. rustica L. contain 1.5 to 9 percent of nicotine, the dry leaves up to 4 percent. In France the culture, manufacture, and sale of tobacco are the subject of a monopoly exploited by the State. The French tobacco administration delivers the tobacco juice with up to about 10 percent of nicotine, which enters into many insecticides to strengthen their action.

The following headings are discussed: Insecticides with a tobacco basis, properties of nicotine, its action on plants, its action on insects, its use as a fumigant in closed spaces, and its use in the open air, which briefly discusses nearly all forms of tobacco insecticides, including nicotine dusts. The names of dozens of insects are also given.

FROST, S. W., and HORSFALL, J. L. (2023)

1925. WORK WITH INSECT PESTS BY THE PENNSYLVANIA STATION. Pa. Agr. Expt. Sta. Bull. 196, pp. 32-33. [Abstract in Expt. Sta. Record 54: 352-353. 1926.]

In a search for a powdered material to replace soap as a spreader in a liquid nicotine spray for plant lice, four materials were compared with fish-oil soap. When used without lime, none of the mixtures gave as high a kill as fish-oil soap and nicotine.

Various soil fumigants were used in lettuce cold frames for control of millipedes. Nicotine sulphate (1:500) resulted in an increased stand. A 2 percent home-mixed nicotine dust worked into the soil one week before the boxes were seeded gave good results.

LABO, A. (2024)

1927. INSECTICIDES IN FLORICULTURE. Riv. Ital. Essenze Profumi 9:19. [In Italian. Abstract in Chem. Abs. 21:2043. 1927.]

Discusses use of nicotine salicylate, tobacco extract, and tobacco vapors against insects which damage flowers.

TROPPMANN, W. (2025)

1927. PEST CONTROL. Leipzig, 440 pp., illus. [In German.]

This book (Schädlingsbekämpfung) briefly discusses nicotine (pp. 185-189, 270-272) from the chemical and insecticidal viewpoints. The nicotine content of air dry tobacco varies according to the kind, climate, soil, fertilizer, and way of planting from 0.5 to 10 percent. For the manufacture of home-made tobacco extract Peters soaked 5 kg. of finely cut dry tobacco leaves three times in 33 l. of water, each time for 24 hours. The nicotine thus extracted contains partly free nicotine, partly nicotine compounds with organic acids. It is usually treated with sulphuric acid and is put on the market as nicotine sulphate. A tobacco extract of 8 to 10 percent nicotine is usually used in Germany, but in the United States an extract known as "Black Leaf 40" and containing 40 percent nicotine is commonly used for insecticidal purposes. Nicotine is used in the control of aphids, caterpillars, sawfly larvae, microlepidopterous larvae, various species of Hempitera (leaf sucking bugs), etc., commonly in conjunction with soap solutions at the ratio of 1 to 1.5 kg. tobacco extract (10-percent), 1 to 2 kg. soft soap, and 100 l. water (pp. 185-189). Powdered tobacco and nicotine dusts and their uses are also discussed (pp. 270-272).

CARRASQUILLA, H. T. (2026)

1928. FUNGICIDES E INSECTICIDES MAS USADOS PARA COMBATIR LAS ENFERMEDADES DE LAS PLANTAS Y DE LOS INSECTOS. Colombia Min. Indus. Dept. de Negocios, Gen. Rept., Circ. No. 1, 8 pp. Bogotá.

The following spray mixture is recommended in Colombia, S. A.: 3 kg. tobacco (leaves or powder), 200 g. sodium carbonate, and 100 l. water (p. 2).

KINDSHOVEN (2027)

1925. INSECT PESTS OF TRUCK CROPS AND THEIR CONTROL. Flugbl. Deut. Landw. Gesell. No. 91, pp. 1-4. [In German.]

The following mixture is recommended in Germany as a contact spray for general purposes against sucking insects: 2 l. tobacco extract (8 to 10 percent nicotine content), 2 kg. soft soap, and 100 l. water. Home-made tobacco extract may be obtained by boiling chopped tobacco leaves and letting them soak for 24 hours (p. 4).

VELITSHKEVITSH, A. (2028)

1928. INSECTS NUISIBLES À L'OIGNON DANS LE GOUVERNEMENT DE NOVGOROD. Defense des Plantes 4 (4-5): 717-728. [In Russian with a French title.]

Against insects infesting onions spray, containing 5 drops of tobacco extract to a glass of water, is recommended in Russia.

CLARK, S. W. (2029)

1929. INSECT PESTS AFFECTING COMMERCIAL CROPS IN THE LOWER RIO GRANDE VALLEY. Jour. Econ. Ent. 22 (5): 789-792. [Abstracts in Biol. Abs. 6 (10): 2329. Entry 22643. 1932.]

Bean leafhoppers are controlled by bordeaux-nicotine spray: cabbage aphid and looper, by nicotine-soap and arsenicals. Harlequin bugs, onion thrips, and aphids are not satisfactorily controlled by nicotine dusts because of high winds and rainy seasons.

NABOKOV, V. A. (2030)

1929. NOUVEL APPAREIL COMBINÈ POUR LA DESINFECTION ET DESINSECTISATION. Russ. Jour. Trop. Med. 7 (8): 350-536. [In Russian with French title. Abstract in Rev. Appl. Ent. (B) 18: 80. 1930.]

Sulphur or tobacco dust is burned in three shallow dishes fixed inside the cylinder one above the other, the two upper ones having a wide opening in the center to allow the fumes from the bottom dish to ascend. A pipe carries the gas into the place to be fumigated, thus avoiding the risk of fire.

WARDLE, R. A. (2031)

1929. THE PROBLEMS OF APPLIED ENTOMOLOGY. 587 pp., illus.

The poisonous character of nicotine fails to protect tobacco plants from insect attack. Theron and Cutler (1924) assert that the presence of nicotine in the growing tobacco plant gradually decreases in percentage as the plant approaches maturity (p. 21).

The literature of nicotine as an insecticide is very briefly reviewed (pp. 219-220).

ARIÈ, J. (2032)

1931. THE USE OF NICOTINE AS AN INSECTICIDE. Arch. Inst. Biol. Defensa Agr. e Animal 4: 121-142, illus., Sao Paulo. [In Portuguese]

In France and Italy where the manufacture of tobacco is a State monopoly, tobacco extract is sold by competent officers with an absolute guaranty as to its percentage of nicotine. In France diluted extracts are sold as well as pure extracts. In order to preserve the former during the summer a certain amount of common salt is added to it. Extracts below 12 percent of nicotine do not keep well. Extracts denatured with Norwegian tar (wood tar) are sold without formality to any person, whereas pure extract is disposed of to pharmacists, druggists, horticulturists or owners of cattle under certain formalities with regard to the identification of the buyers and to the specific use of the extract. Brazilian cord-tobaccos are rich in nicotine, many containing as much as 10 percent.

LITTLE, V. A. (2033)

1931. A PRELIMINARY REPORT ON THE INSECTICIDAL PROPERTIES OF DEVIL'S SHOESTRING, CRACCA VIRGINIANA LINN. Jour. Econ. Ent. 24: 743-754. [Abstract in Rev. Appl. Ent. (A) 19: 549. 1931.]

Aqueous suspensions of the powdered roots of the above plant compare favorably in toxicity with derris, pyrethrum, and nicotine sulphate (40-percent).

PAILLOT, A. (2034)

1931. INSECTS INJURIOUS TO VEGETABLE GARDENS AND VINEYARDS. 366 pp., illus. Paris. [In French.]

Nicotine is discussed as an insecticide (pp. 17-19) and the following formula (pp. 66-67) is given: 100 to 150 g. pure nicotine, 1 kg. white Marseille soap, and 100 l. water (preferably rain water). This soap is preferable to black soap because it has a higher sticking property. If nicotine extract is used, containing 500 g. nicotine sulphate to the liter it is necessary to use from 200 to 300 cc. per 100 l. The use of soap in this kind of spray is indispensable in order to render it adhesive to the leaves and also to favor the release of fumes. Nicotine is used in sprays against various aphids, leafhoppers and psyllids (pp. 249-300).

CARTER, W. (2035)

1932. COMPARISON OF TOBACCO DUST WITH OTHER FORMS OF NICOTINE IN CONTROL OF YELLOW SPOT DISEASE OF PINEAPPLES. Jour. Econ. Ent. 25 (5): 1031-1035. [Abstract in Expt. Sta. Rec. 68: 349. 1933.]

In tests of tobacco dust and 7 other nicotine forms by the Hawaiian Pineapple Canners' Experiment Station as a control against yellow spot, the results obtained clearly indicate the superiority of tobacco dust over the other nicotine applications.

TURNER, N. (2036)

1932. NOTES ON ROTENONE AS AN INSECTICIDE. Jour. Econ. Ent. 25 (6): 1228-1237, illus. [Abstract in Rev. Appl. Ent. (A) 21: 76. 1933.]

Certain experiments in which total cubé extract or rotenone were used, and in some cases compared with 40-percent nicotine sulphate, showed rotenone in small amounts to be highly toxic to a number of insects, a list of which is given.

YAGO, M. (2037)

1933. CHANGES IN THE FAUNA OF INJURIOUS INSECTS IN THE PEAR ORCHARDS. Jour. Plant Protect. 20: 27-32. [In Japanese. Abstract in Rev. Appl. Ent. (A) 21: 263. 1933.]

Changes have occurred in the relative prevalence of insect pests in pear orchards in Shizuoka. Those that were formerly abundant but are now scarce include 11 species, the reduction in their numbers being probably due to the recent use of nicotine sulphate and other insecticides.

FARLEY, A. J. (2038)

1934. PEACH AND APPLE SPRAYING EXPERIENCES IN NEW JERSEY. Peninsula Hort. Soc. [Del.] Trans. 1933, pp. 69-74. [Abstract in Rev. Appl. Ent. (A) 22: 299-230. 1934.]

The difficulty of applying the oil emulsion-cresylic acid spray against aphids and lime-sulphur against scab within the relatively short delayed dormant period may possibly be avoided by the application of a combination of Coposil, sufficient oil emulsion without cresylic acid to give 3 percent actual oil and 1/2 - 3/4 pt nicotine sulphate in 100 gal. at the late delayed dormant period. This spray should be effective against coccids, red mite, aphids, and scab.

ILISCH, W. (2039)

1923. PROTECTING PLANTS AGAINST ANIMAL PESTS, FUNGI, ETC. German Paten 484, 489. Sept. 8. [In German. Abstract in Chem. Abs. 24: 1177. 1930.]

The juice or extract of a plant, e.g., tobacco, which is not liable to attack by the pests to be warded off is introduced into the sap stream of the plant to be protected.

KOBIOLKE, A. M. (2040)

1928. VACUUM, HEAT AND POISONOUS FUME TREATMENT TO DESTROY BORER, LARVAE, BEETLES, ETC., IN TIMBER. United States Patent 1,672,326, June 5. [Abstract in Chem. Abs. 22: 2635. 1928.]

Tobacco fumes may be used in this apparatus.

VINCENT-RENTSCH, M. (2041)

1928. VINE WASH. Swiss patent 131,744. Nov. 19. [Abstract in Chem. Abs. 23: 5001. 1929.]

A wash for destroying vermin on vines is prepared by digesting tobacco with garlic bulbs and adding mineral oil to the digest.

KONIG, C. (2042)

1930. PREPARATION FOR DESTROYING GRUBS, BLIGHT, ETC. Swiss Patent 140,348, Jan. 29. [Abstract in Chem. Abs. 25: 768. 1931.]

The preparation contains tobacco extract (14 percent strength), ferrous sulphate, slaked lime or calcium carbide residue and ammonium sulphide.

HEADLEE, T. J. (2043)

1934. NICOTINE INSECTICIDE. United States Patent 1,958,407, May 15. [Abstract in Chem. Abs. 28: 4532. 1934.]

A solution containing nicotine and substantially pure sodium oleate or potassium oleate is suitable for effective use even when highly diluted.

4. Species of Insects Named, 1901-1933

GARMAN, H. (2044)

1901. ENEMIES OF CUCUMBERS AND RELATED PLANTS. Ky. Agr. Expt. Sta. Bull. 91, pp. 1-56, illus.

Against the striped cucumber beetle (Diabrotica vittata) tobacco dust and tobacco decoction have often been recommended by various persons (p. 9). Under remedial treatment for the melon aphid (Aphis gossypii) tobacco decoction, Rose Leaf Insecticide, Skabcure Dip (containing 40 percent nicotine), Nikoteen punk, and home-made fumigators are discussed (pp. 19-24). Some of these were also used against the cucumber thrips (Thrip tabaci) (p. 44). A spray containing 1 teaspoonful of nicotine (40-percent) in a pt. of water, did not kill the greenhouse pill-bug (Armadillidium vulgare) (p. 46).

SMIRNOFF, A. (2045)

1903. TOBAKSEXTRAKT OCH DESS ANVANDNING I KAMPEN MOT SKADEINSEKTER. Svenska Trädgårdsför. Tidskr. [Sweden] No. 4, pp. 60-62. [In Swedish.]

In Sweden tobacco extract is used against Thrips tabaci L., Zabrus gibbus, Lema melanopa, Ericampa adumbrata, Tingis piri, Conchylis ambiguella, and Dactylopius longispinus. Various formulas are given. One contains 1,250 g. tobacco extract, 865 g. soap, 19 g. pulverized naphthaline, and 104 l. water. Another contains 725 to 750 g. tobacco extract, 750 to 1,000 g. sulphur, and 21 l. water. And a third contains 1.5 percent solution of tobacco extract and 0.5 percent solution of alkali soap.

WASHBURN, F. L. (2046)

1908. DIVISION OF ENTOMOLOGY. Minn. Agr. Expt. Sta. Bull. 112, pp. 145-254, illus.

Tobacco decoction with soap killed young apple leafhoppers (Empoasca mali LeB.), but the spray had little or no effect upon the adults (p. 158). No definite results were obtained when tobacco decoction was sprayed on cabbage maggots (p. 211), but when applied with a watering pot a decoction (1.5 lb. of stems steeped in 4 gal. water) gave good results (p. 213). Tobacco dust, scattered thickly in the rows before sowing the radish seed, was a good fertilizer and insecticide (p. 210).

GARMAN, H. (2047)

1913. FUMIGATION AND SPRAYING. Ky. Agr. Expt. Sta. Bull. 172, pp. 193-209, illus.

A 40 percent nicotine extract used in the proportion of 1 oz. to 2 oz. of water for each 2,500 cu. ft. enclosed has been found effective for destroying aphids. The fumes are driven off by pouring the tobacco extract and water into a pan, then dropping in this a flat piece of iron heated red hot and leaving the fumes about the plants over night (p. 201). A solution of sodium hydroxide or potassium hydroxide added to Black Leaf 40 produces fumes which quickly kill plant lice, plant bugs (Pentatomidae), flesh flies, and grain weevils (Calandra oryzae). The adult whitefly and one of the clover plant lice were also killed on a pot of red clover in the hothouse, using 1 fl. oz. each of Black Leaf 40 and of sodium hydroxide in concentrated solution (p. 201). For rose bushes infected with plant lice and slugs, there is no better spray than a strong tobacco extract either home-made or manufactured (p. 207).

GLASENAPP, S. (2048)

1913. SPRAYING APPLE TREES IN BLOSSOM WITH TOBACCO EXTRACT. Mem. Bur. Appl. Bot. 6 (4): 243-250. [In Russian. Abstract in Rev. Appl. Ent. (A) 1: 370-371. 1913.]

The trees were sprayed twice in one day with an extract of tobacco prepared by boiling 1 lb. of *Nicotiana rustica* for 15 minutes in 3 gal. of water and diluting with 6 gal. of water. This spray destroyed *Psylla mali*, young caterpillars of *Cheimatobia brumata*, Tortricidae and similar pests.

LOVETT, A. L. (2049)

1913. INSECT PESTS OF TRUCK AND GARDEN CROPS. Ore. Agr. Expt. Sta. Bull. 91 (Extension Series II, no. 5), 39 pp., illus. [Abstract in Rev. Appl. Ent. (A) 2: 159-161. 1914.]

A soil dressing of 10 parts sulphur and 1 part tobacco dust, will repel millipedes. Five parts of sulphur to 1 part of tobacco dust applied in the drill rows with the seed of radish and turnip gave good results against *Phorbia brassicae* Bouche. Powdered tobacco placed about the plants at the time of planting and renewed every week has also proved useful. Black Leaf 40 (1:1600) plus 1 lb. whale-oil soap to 20 gal. has given excellent results against the cabbage aphid (*Aphis brassicae* L.). Black Leaf 40(1:1600) plus 4 lb. whale-oil soap per 100 gal. will control onion thrips (*Thrips tabaci* Lind.).

WATSON, J. R. (2050)

1914. TOMATO INSECTS, ROOT-KNOT AND "WHITE-MOLD." Fla. Agr. Expt. Sta. Bull. 125, pp. 57-78, illus. [Abstract in Rev. Appl. Ent. (A) 3: 176-179. 1915.]

Against the grain thrips (*Euthrips tritici projectus*) tobacco decoctions are very effective. Black Leaf 40 (1 to 1,000 or 1,800) and home-made tobacco extract (1 to 10) were also used. The following mixture was used on tomatoes: 3.5 oz. Black Leaf 40, 2 1/3 qt. lime-sulphur, and 50 gal. water, with the result that about 75 percent of the thrips present were killed. Kerosene emulsion, soap, tobacco decoctions, and tobacco extracts are recommended against tomato aphids (*Megoura solani* and *Myzus persicae*), while flea-beetles may be checked by dusting with ashes, air-slaked lime, or tobacco dust, or by spraying with kerosene emulsion or tobacco decoction.

FELT, E. P. (2051)

1915. TWENTY-NINTH REPORT OF THE STATE ENTOMOLOGIST 1913. NEW YORK STATE MUSEUM BULL. 175, 257 pp., illus. [Abstract in Rev. Appl. Ent. (A) 3: 472-475. 1915.]

The pear thrips (*Taeniothrips* (*Euthrips*) *pyri* Daniel) was for the most part controlled by timely and thorough applications of tobacco extract. The redbugs Heterocordylus malinus and Lygidea mendax seem very susceptible to tobacco preparation, the young being destroyed by a Black Leaf extract diluted 1 to 65 or Black Leaf 40, 1 to 800. Where practicable the winter application for San Jose scale (Aspidiotus perniciosus) may be delayed as late as possible and 3/4 pt. of Black Leaf extract may be added to each 100 gal. for the purpose of destroying redbug as well as San Jose scale; this treatment would also be very effective in checking aphids.

PARROTT, P. J. (2052)

1915. INSECTS AFFECTING PRODUCTION AND GRADING OF FRUIT. Western N.Y. Hort. Soc. Proc. 60th Ann. Meeting, pp. 1-10, illus. [Abstract in Rev. Appl. Ent. (A) 3: 734. 1915.]

For rosy aphid (Aphis sorbi) the best spray is 3/4 pt. nicotine (40-percent) in 100 gal. water to which is added from 3 to 5 lb. dissolved soap. The best spray for the control of redbugs (Heterocordylus malinus and Lygidea mendax) is nicotine (1:800) plus 3 to 5 lb. soap to 100 gal. Better results are obtained by mixing tobacco with emulsions. Mixing tobacco with acid or neutral lead arsenate, lime sulphur or soap leaves the properties unchanged.

CLEMENT, A. L. (2053)

1916. INSECT PESTS OF THE WILLOW. Vie Agr. et Rurale 6 (32): 99-103, illus., Aug. 5. [In French. Abstract in Rev. Appl. Ent. (A) 4: 423-424. 1916.]

Against the larvae of the chrysomelids (Phyllodecta vitellinae and P. vulgatissima) dusting with quick lime is recommended followed by a spray of a nicotine solution prepared as follows: 10 lb. of black soap is dissolved in 4 to 5 gal. of hot water and 2 lb. of sodium carbonate is dissolved in 1 gal. of water; the two solutions are mixed and 1 gal. of spirit, 2 gal. of tobacco extract and 95 gal. of water are added. Various cercopids, aphrophorids and tettigonids may be destroyed by repeatedly spraying with a 2-percent black soap solution or with a solution containing 2 percent black soap and 2 percent nicotine. These sprays are also effective against Aphis saliceti and Melanoxanthesium (Melanoxanthus) salicis; and with the addition of 2 lb. of sodium carbonate and 1 gal. of spirit per 100 gal. of insecticide these solutions are useful against Kermes salicis.

DANILTCHENKO, J. M. (2054)

1916. CHRYSANTHEMUMS AND THEIR CULTIVATION. Gard. Library - sup. to Prog. Hort. and Market Gard. 31 pp., illus. [In Russian. Abstract in Rev. Appl. Ent. (A) 4: 164. 1916.]

Disinfection of the soil with carbon disulphide or tobacco extract is recommended against Mysospatha (Cecidomyia) hypogaea and the nematode Heterodera radicicola. Against Aphis rumicis (papaveris), the larvae of the bug Calocoris chenopodii, the caterpillars of

Cyalia (*Grapholittia*) *minutana* and other pests attacking the buds and flowers, spraying with tobacco extract and soap, powdering with tobacco dust and flowers of sulphur when the dew is on the leaves in the morning, or fumigation with tobacco are advised.

EDMUNDSON, W. C. (2055)

1916. INSECT PESTS OF THE ORCHARDS AND GARDENS OF IDAHO AND THEIR CONTR Idaho Agr. Expt. Sta. Bull. 87, 31 pp., illus. [Abstract in Rev. Appl. Ent. (A) 4: 265-267. 1916.]

A spray consisting of Black Leaf 40 or kerosene emulsion should be applied when the young of the cottony maple scale (*Pulvinaria vitis* L.) first appear. The oyster shell scale (*Lepidosaphes ulmi* L.) and the scurfy scale (Chionaspis furfura Fitch.) can also be controlled by spraying with Black Leaf 40. Black Leaf 40 should be used against *Eulecanium* (*Lecanium*) *corni* Bch. at the time of hatching. Kerosene emulsion or Black Leaf 40 are effective sprays against *Empoasca mali* LeB., the apple leafhopper.

FRENCH, C. JR. (2056)

1916(?) INSECT PESTS OF THE FRUIT, FLOWER AND VEGETABLE GARDEN. Jour. Dept. Agr. Victoria, 14 (4, 5, 7, 8, 10): 213-218; 314-317; 433-438; 495-498; 604-611, illus. [Abstract in Rev. Appl. Ent. (A) 5: 107-108. 1917.]

The red spider, (*Tetranychus telarius*) can be controlled by tobacc water in summer. The rutherglen bug (*Nysius vinitor*) should be checked by tobacco sprays. Nicotine is one of the sprays recommended against *Thrips tabaci* Lind. Tobacco water is one of the sprays recommended against the rose aphid.

MELANDER, A. L., and HEALD, F. D. (2057)

1916. THE CONTROL OF FRUIT PESTS AND DISEASES. Wash. Agr. Expt. Sta. Pop. Bull. 100, pp. 1-63.

Nicotine (Black Leaf 40 or other 40-percent nicotine) sprays are briefly described (pp. 8, 14) and recommended for the following: woolly aphid (*Eriosoma lanigera*) (p. 15), San Jose scale (*Aspidiotus perniciosus*) (p. 17), cottony scale (*Pulvinaria vitis*) (p. 18), various species of thrips (p. 21), green apple aphid (*Aphis mali*) (p. 22), rosy apple aphid (*Aphis sorbi*) (p. 22), several species of peach and plum aphids, and black cherry aphid (*Myzus cerasi*) (p. 23), leafhoppers (*Empoasca mali* and others), apple tingis (*Corythuca annulata*), and orchard or brown mite (*Byrobia pratensis*) (p.24)

ROMANOVSKY-ROMANKO, A. (2058)

1916. THE TREATMENT OF AN ORCHARD. Messenger of Gard., Fruit-growing and Market-gard. - 56 and 57 (12 nos.): 1915-1916. [In Russian. Abstract in Rev. Appl. Ent. (A) 5: 249-250. 1917.]

Flowering trees were sprayed with water then dusted with powdered tobacco to protect them against the attacks of Epicometic (Tropinota).

ORTON, W. A., and CHITTENDEN, F. H. (2059)

1917. CONTROL OF DISEASES AND INSECT ENEMIES OF THE HOME VEGETABLE GARDEN. U. S. Dept. Agr. Farmers' Bull. 856, 72 pp., illus.

Nicotine sulphate sprays with soap are briefly described (pp. 10-11) and recommended for the following insects: Various plant lice and onion thrips (p. 19), tarnished plant bug (Lygus pratensis) (p. 20), bean aphid (p. 29), harlequin cabbage bug (Murgantia histrionica) (p. 34), plant lice (p. 35), and melon aphid (Aphis gossypii) (p. 46).

SMITH, L. B. (2060)

1917. CONTROL OF SOME GARDEN INSECTS. Va. Truck Expt. Sta., Bull. 23, pp. 489-506, illus. [Abstract in Rev. Appl. Ent. (A) 5: 527-530. 1917.]

Nicotine sulphate was recommended as a control for six species of aphids (Macrosiphum solanifolii, Aphis brassicae, A. gossypii, A. rumicis, Acyrthosiphon pisi, and Rhopalosiphum persicae), and for the onion thrips (Thrips tabaci). It killed 65 to 75 percent of the nymphs and 40 to 50 percent of the adults of the harlequin cabbage bug (Murgantia histrionica). It also killed the nymphs of the squash bug (Anasa tristis). Tobacco dust was used as a deterrent against cucumber beetles (Diabrotica vittata), the red spider (Tetranychus sp.), and springtails (Smynthurus).

WATSON, J. R. (2061)

1917. FLORIDA TRUCK AND GARDEN INSECTS. Fla. Agr. Expt. Sta. Bull. 134, pp. 35-127, illus. [Abstract in Rev. Appl. Ent. (A) 5: 305-307. 1917.]

The cabbage root-maggot (Chortophila fusciceps) is best dealt with by placing some repellent, such as tobacco dust about the roots of young plants. The tarnished plant bug (Lygus pratensis) and false chinch bug (Nysius angustatus) are controlled by strong tobacco extract and soap. The garden flea hopper (Haltica uhleri) can be controlled by tobacco extract. Thrips tabaci is easily controlled by tobacco extract and whale-oil soap. Watermelons are infested by Aphis gossypii, for which the suggested controls are spraying with Black Leaf 40 and soap solution, fumigating with tobacco, or dusting with tobacco dust when the young plants are wet with dew, and clean culture.

BURRILL, A. C. (2062)

1918. NEW ECONOMIC PESTS OF RED CLOVER. Jour. Econ. Ent. 11: 421-424. [Abstract in Rev. Appl. Ent. (A) 7: 35-36. 1919.]

Preliminary tests with orchard sprayers driven through the fields have shown that a majority of the aphids may be destroyed, with nicotine sulphate and soap at the usual strengths. Adults of *Hippodamia convergens* (a coccinellid enemy of aphids) confined in small capsules of sprayed leaves, however, die from its effects. The addition of nicotine did not increase the scorching effects of sodium arsenite sprayed on lucerne and clover. In spraying with nicotine and soap for bean thrips (*Heliothrips fasciatus* Perg.) at the usual strength and with an orchard power sprayer it was found that a large part of the infestation had not been reached by the spray. This was found to be due to a concurrent attack of *Tetranychus telarius* L. (red spider) the leaves being so webbed together as to protect large numbers of thrips from being wetted.

EDMUNDSON, W. C., and WELCH, J. S. (2063)

1918. THE HOME GARDEN IN IDAHO. Idaho Univ. Agr. Expt. Sta. Bull. 106, 30 pp., illus. [Abstract in Rev. Appl. Ent. (A) 8: 285-286. 1920.]

Black Leaf 40 is used to control cabbage aphid (*Brevicoryne* (*Aphis*) *brassicae*), melon aphis (*A. Gossypii*), and onion thrips (*Thrips tabaci*).

FELT, E. P. (2064)

1918. 33d REPORT OF THE STATE ENTOMOLOGIST ON INJURIOUS AND OTHER INSECT OF THE STATE OF NEW YORK, 1917. N. Y. State Mus. Bull. 202, pp. 1-240, illus.

Control work on the potato aphid (*Macrosiphum solanifolii* Ashm.) has demonstrated the efficacy of the nicotine soap preparation, using 3/4 pt. 40-percent nicotine to 100 gal. water, to which are added 6 to 8 lb. of any cheap soap (p. 43). The same spray (p. 49) will control redbugs (*Heterocordylus malinus* Reut. and *Lygidea mendax* Reut.) and the raspberry beetle (*Byturus unicolor* Say) (p. 50). Tobacco soap preparations should also be used against the black vine weevil (*Otiorhynchus sulcatus* Fabr.) (p. 58) and European earwig (*Forficula auricularia* Linn.) (p. 62). Nicotine sulphate (40 percent nicotine) with soap is also recommended against the European springtail (*Isotoma minuta* Tullb.) (p. 62).

HAGAN, J. (2065)

1918. SPRAYING EXPERIMENTS. Jour. Dept. Agr. and Tech. Instr. for Irelan 18 (2): 186-188, illus. [Abstract in Rev. Appl. Ent. (A) 7: 63. 1919.]

Various methods of extracting refuse tobacco stalks were tested namely (1) steeping the stalks 3 times in cold well-water (2) steeping them twice in cold well-water, the stalks being pressed after the first steeping (3) steeping the stalks once in cold well-water and pressing once (4) steeping them three times in fresh cold well-water; the total amount of water used in each case being about 1 gal. to 1 lb. of stalks. The four different extracts gave results equally satisfactory against capsid bugs, larvae of tortricids and the winter-moth (*Cheimatobia brumata*). The extracts were also tested with good results on the apple aphid (*Aphis pomi*), apple sucker (*Psylla mali*), gooseberry aphid (*Aphis grossulariae*), and rose aphid (*Aphis rosae*).

QUAINTANCE, A. L., and SIEGLER, E. H. (2066)

1918. INFORMATION FOR FRUIT GROWERS ABOUT INSECTICIDES, SPRAYING APPARATUS, AND IMPORTANT INSECT PESTS. U. S. Dept. Agr. Farmers' Bull. 908. 99 pp., illus.

This bulletin was revised in 1920, but without change in the section devoted to nicotine.

The following information was taken from the 1918 edition. In the mixture of tobacco fish-oil soap the nicotine content should be 0.05 to 0.06 percent (p. 37). Under tobacco or nicotine insecticides the following headings are briefly discussed (pp. 40-42): Commercial nicotine solutions, home-made nicotine sprays, formula for making nicotine extract, methods of making nicotine sprays, and tobacco dust.

A chart (p. 73) is given, showing that nicotine can be combined with arsenate of lead, arsenate of lime, and paris green; also further combined with soap, lime sulphur, or bordeaux mixture; and the kinds of fruits and types of insects are indicated. A spray dilution table (p. 75) for ready reference is given.

Nicotine (40-percent nicotine sulphate) is used in control measures against the following insects: apple aphids (*Aphis malifoliae* Fitch, *A. pomi* De Geer., and *A. avenae* Fab.) (p. 77), apple redbugs (*Heterocordylus malinus* Reuter and *Lygidea mendax* Reuter) (p. 79), pear-tree psylla (*Psylla pyricola* Förster) (p. 85), pear thrips (*Taeniothrips inconsequens* Uzel.) (p. 86), cherry aphid (*Myzus cerasi* Fab.) (p. 92), plum aphids (*Aphis setariae* Thomas, *Phorodon humuli* Shcrank, and *Hyalopterus arundinis* Fab.) (p. 94), grape leafhopper (*Typhlocyba comes* Say.) (p. 95), grapevine aphid (*Microsiphum illinoiensis* Skimer) (p. 98), and currant aphid (*Myzus ribis* L.) (p. 99).

BORNE, W. T., and ESSIG, E. O. (2067)

1921. PLANT DISEASE AND PEST CONTROL. Calif. Coll. Agr. Expt. Sta. Circ. 227, pp. 1-69.

The following tobacco preparations are briefly described and recommended for a wide variety of insects (pp. 62-65).

Formula 24
Distillate emulsion -- 10 gal.
Black Leaf 40 -------- 1 pt.
Water to make --------200 gal.

Formula 24 b
Distillate emulsion -- 6 gal.
Black Leaf 40 -------- 1.5 pt.
Water to make -------200 gal.

Formula 24 a
Miscible oil -------- 5 gal.
Black Leaf 40 ------- 1 pt.
Water to make ------200 gal.

Formula 24 c
Miscible oil ---------- 3 gal.
Black Leaf 40 --------- 1.5 pt.
Water to make ---------200 gal.

Formula 27
Tobacco extract 40%
nicotine sulphate 1 pt.
Fish-oil soap ------ 4 to 5 lb.
Water ------------- 100 to 150 gal.

Formula 27 a
Nicotine sulphate 40% -- 1 pt.
Dry billboard paste ---- 2 lb.
Water -----------------150 gal.

Nicotine dusts, called "Nicodust" by R. E. Smith, contained 2, 4, 5, 6, and 10 percent of Black Leaf 40.

For fungus diseases and aphids, a 40 percent nicotine sulphate may be added to sulphur sprays, and a sulphur nicodust may also be used for mildew and aphids (p. 37).

The preceding tobacco preparations were recommended against the following insects:

Apple aphids (*Aphis pomi* DeG. and *A. malifoliae* Fitch) - formula 24 or 27, or a 5 to 6% nicodust (p. 5).

Woolly apple aphid (*Eriosoma lanigerum* Hausm.) - formula 27 (p. 6)

Asparagus beetle (*Crioceris asparagi* Linn.) - formula 24 or 27, or a 6% nicodust (p. 9).

Bean aphid (*Aphis rumicis* Linn.) and bean thrips (*Heliothrips fasciatus* Perg.) - formula 27 a, or a 5% nicodust (p. 10, 11).

Cabbage aphid (*Aphis brassicae* Linn.) - formula 24 or 27; nicodust gives only partial control (p. 13).

Cabbage worm (*Pontia rapae* Linn.) - formula 27 or a 5% nicodust (p. 14).

Aphids on celery (*Rhopalosiphum persicae* Sulz. and *Siphocoryne capreae* Fab.) and cherry aphid (Myzus cerasi Fabr.) - formula 27 or 5% nicodust (p. 14, 15).

Cherry slug (*Caliroa cerasi* Linn.) - 2 or 5% nicodust (p. 15).

Chrysanthemum gall fly (*Diarthronomyia hypogaea* Low.) - formula 27 (p.16).

Chrysanthemum leaf miner (*Phytomyza chrysanthemi* Kow). - maggots are killed by applying 40-percent nicotine sulphate (1 to 600) (p.16).

Citrus thrips (*Scirtothrips citri* Moult.) - formula 24 or 6% nicodust (p. 18).

Cucumber beetles (*Diabrotica soror* Lec. and *D. trivittata* Mann) -

larvae on roots may be killed by pouring upon them 40-percent nicotine sulphate (1 to 1,000) (p.20).

Sphinx moth (Pholus achemon Drury) - spray vines with lead arsenate plus 40-percent nicotine sulphate (1 pt. to 200 gal.) (p. 24).

Grape leafhopper (Erythroneura comes Say) - formula 27, or with 40 percent nicotine sulphate, 1 lb.; liquid soap, 1/3 gal.; water, 200 gal. The young and adults may also be killed with a 10 percent nicodust, or a 6 percent nicosulphur dust (p. 25).

Butterfly on hollyhock (Vanessa caryae Hubn.) - 40-percent nicotine sulphate (1 to 600) to kill caterpillars (p. 26).

Hop aphid (Phorodon humuli Schr.) - formula 27 or 5 percent nicodust (p. 26).

Melon aphid (Aphis gossypii Glover) - 40-percent nicotine sulphate (1 to 1,000) or 5 percent nicodust (p. 26).

Squash bug (Anasa tristis DeGeer) - 40-percent nicotine sulphate (1 to 600) or a 10 percent nicodust (p. 27).

Onion thrips (Thrips tabaci Lind.) - 40-percent nicotine sulphate (1 to 200) or 5 percent nicodust (p. 29).

Pea aphid (Macrosiphum pisi Kalt.) - formula 27 a, or a 10 percent nicodust, or a 6 percent nicosulphur dust (p. 29).

Black peach aphid (Aphis persicae-niger Smith) - formula 27, or a 5 percent nicodust (p. 30).

Pear thrips (Taeniothrips inconsequens Uzel.) - formula 24, or 5 or 6 percent nicodust (p. 33).

Mealy plum louse (Hyalopterus arundinis Fabr.) - formula 27, (p. 35).

Aphids on potatoes - 5 percent nicodust, or 40-percent nicotine sulphate (1 to 800) (p. 36).

Flea beetles and leaf beetles on potatoes - a nicodust lead arsenate (p. 36).

Aphids on rose (Macrosiphum rosae Linn. and Myzaphis rosarum Walk.) - 5 percent nicodust or 40-percent nicotine sulphate (1 to 1,000) (p. 37).

Rose snout beetle (Rhynchites bicolor Fabr.) - A 10 percent nicodust has given good control in some places (p. 37).

Strawberry aphid (Myzus fragaefolii Ckll.) - 5 percent nicodust (p. 39).

Flea beetles on tomatoes - nicodust and lead arsenate (p. 41).

Walnut aphid (Chromaphis juglandicola Kalt.) - 2 percent nicodust (p. 42).

Slugs and snails - 5 percent nicodust (p. 48).

RUSSELL, H. L., and MORRISON, F. B. (2068)

1922. NEW PAGES IN FARMING. Wis. Agr. Expt. Sta. Ann. Rept. 1920-1921. Bull. 339, 142 pp., illus. [Abstract in Rev. Appl. Ent. (A) 10: 378-379.]

Nicotine sulphate (1 to 1,000), with soap, was used against the cherry aphid (Myzus cerasi). Nicotine dust was of great value against many chewing and sucking insects, but cannot replace the arsenicals against such insects as the Colorado potato beetle and cabbageworms (Pieris).

PARROTT, P. J., and GLASGOW, H. (2069)

1923. THE INSECTICIDAL PROPERTIES OF TOBACCO DUST. Jour. Econ. Ent. 16: 90-95. [Abstract in Rev. Appl. Ent. (A) 11: 227. 1923.]

Ground tobacco containing 1 percent nicotine was not so effective as dusts containing nicotine sulphate. The fine tobacco dust was highly toxic against some aphids and the apple redbug (Heterocordylus malinus Reut.). The rosy aphid (Anuraphis roseus Baker) was effectively combated with either nicotine sulphate or tobacco dust incorporated in lime-sulphur or sulphur-glue sprays.

HALEY, D. E., OLSON, O., and FOLLWEILER, F. L. (2070)

1925. STUDIES ON NICOTIANA RUSTICA AS A SOURCE OF NICOTINE FOR INSECT CONTROL. Jour. Econ. Ent. 18: 807-817. [Abstract in Rev. Appl. Ent. (A) 14: 76-77. 1926.]

The rate of nicotine evolution from ground Nicotiana rustica plants (nicotine = 5 percent) was measured by the death rate or suspended animation of Aphis brassicae L. (cabbage aphid) and other soft-bodied insects. Addition of water to a mixture of ground tobacco and basic material resulted in the evolution of nicotine. A mixture of 5 parts tobacco, 5 parts hydrated lime, and 3 parts water proved a very efficient insecticide against currant worms, various aphids, leafhoppers and many other insects under both laboratory and field conditions (nicotine = 2 percent). Under the same conditions calcium oxide was not quite so efficient as hydrated lime in liberating the nicotine.

KELSALL, A., SPITTALL, J. P., GORHAM, R. P., and WALKER, G. P. (2071)

1926. DERRIS AS AN INSECTICIDE. Ontario Ent. Soc. 56th Ann. Rept. 1925, pp. 24-40. [Abstract in Rev. Appl. Ent. (A) 15: 34-36. 1927.]

Derris was much more effective than nicotine sulphate at practical strengths against the orchard tent caterpillar (Malacosoma americana F.). Dusting with derris 10 to 1.25 percent and hydrated lime gave 100 percent control on all plots against larvae of Pteronus ribesii Scop., whereas a 2 percent nicotine dust gave only about 80 percent control.

In sprays against Aphis pomi DeG. (green apple aphid) 2 1/2 lb. derris in 100 gal. water, with soap, gave complete control, but without soap it was less effective at twice that strength; 40-percent nicotine sulphate (1:800) gave about 95 percent control with or without soap. As a dust 10 percent derris with hydrated lime was much less effective than 40-percent nicotine sulphate at 5 percent possibly because of lack of moisture.

In laboratory tests with Macrosiphum solanifolii Ashm. (potato aphid) 1/2 pt. 40-percent nicotine sulphate to 100 gal. water was as effective as 5 lb. derris both giving complete control.

In a laboratory experiment with Aphis rumicis L. 5 lb. derris in 100 gal. water gave only 40 percent control in the same time that 1/2 pt 30 percent nicotine sulphate to 100 gal. gave 90 percent control, but two days later all the aphids treated with derris were dead.

RICHARDSON, C. H, and SMITH; C. R. (2072)

1926. TOXICITY OF DIPYRIDYLS AND CERTAIN OTHER ORGANIC COMPOUNDS AS CONTACT INSECTICIDES. Jour. Agr. Res. 33 (7): 597-609, illus. [Abstract in Rev. Appl. Ent. (A) 15: 140, 1927.]

A crude dipyridyl oil was found to be highly toxic, but less so than nicotine, against six species of aphids. In submergence tests, the crude oil was more toxic than nicotine to two species of coleopterous larvae (Leptinotarsa decemlineata Say. and Lema trilineata Oliv.) and one specie of Lepidoptera (Ephestia kühniella Zell.), but less toxic than nicotine to adult potato beetles and to silkworms.

BRITTON, W. E. (2073)

1927. TWENTY-SIXTH REPORT OF THE STATE ENTOMOLOGIST OF CONNECTICUT 1926. Conn. Agr. Expt. Sta. Bull. 285, pp.159-283, illus.

Pea aphids (Illinoia pisi Kalt.) were nearly all killed by a nicotine spray. The young squash bugs (Anasa tristis DeG.) can be killed by a spray of 40-percent nicotine solution (1 to 150). In Massachusetts the same spray killed the eggs of the squash borer (Melittia satyriniformis Hübn.). Plants bearing potato flea beetles (Epitrix cucumeris Harr.) can be freed by spraying with nicotine sulphate solution. The asparagus beetle (Crioceris asparagi Linn.) may be killed in home gardens by spraying with nicotine solution (pp.170-173).

GUYTON, T. L., and McCUBBIN, W. A. (2074)

1927. ROSE INSECTS AND DISEASES. Pa. Dept. Agr. Gen. Bull. 441, 10 (5): 1-17, illus.

Aphids (Macrosiphum rosae) and Thrips tabaci Lind. on roses are controlled by the use of nicotine. In the sprays use 40 percent nicotine sulphate and soap, and the dust should contain 2 percent nicotine and should be carried in sulphur or lime or both (pp.4,7)

Against all kinds of insects infesting roses use the following formula: 2 teaspoonfuls Black Leaf 40, 10 teaspoonfuls lead arsenate, and 1 gal. Bordeaux mixture (p. 16).

KANENO, K., and KAMISHINA, S. (2075)

1927. STUDIES ON PREVENTING THE OVIPOSITION OF CHILO SIMPLEX. Jour. Plant Protect. 15 (2): 77-83. [In Japanese. Abstract in Rev. Appl. Ent. (A) 15: 221. 1927.]

Spraying with repellents against Chilo simplex did not prove of economic value. Nicotine sulphate and tobacco dust greatly reduce the percentage of hatching of the eggs and prevent the larvae from entering the rice stalks.

KATSUYAMA, Y. (2076)

1927. ON THE CONTROL OF DELPHAX FURCIFERA HORV. INFESTING THE RICE PLANT. Insect World 31 (3): 93-96. [In Japanese. Abstract in Rev. Appl. Ent. (A) 15: 280. 1927.]

The application of tobacco dust, pure or mixed with lime or ashes, is recommended for the control of Delphax furcifera Horv. on rice.

WORTHLEY, H. N. (2077)

1927. REDUCING THE COST OF NICOTINE SULPHATE SPRAYS. Jour. Econ. Ent. 20: 615-625. [Abstract in Rev. Appl. Ent. (A) 16: 83-84. 1928.]

Studies were conducted to discover the merits of a number of chemicals as liberators of nicotine from spray solutions of 40-percent nicotine sulphate. Among those tried, sal soda appeared to throw off the nicotine most rapidly, while under conditions where it is desirable to liberate the nicotine slowly over a longer period of time, potash fish-oil soap proved most suitable, mixing readily with water and giving a beneficial physical character to the spray solution. The amount of sal soda or potash fish-oil soap required to neutralize 1 cc. nicotine sulphate is 0.34 g. or 1.1 cc., respectively. The evolution of nicotine from 1 to 100 nicotine sulphate with twice this amount of sal soda is 61 percent in 4 hours, and 100 percent in 24 hours; with twice the amount of potash fish-oil soap the percentages are 34, 69, and 74 in 4, 24, and 48 hours as compared with 15, 30, and 35 in the absence of any liberator. Sal soda is a more efficient liberator than sodium hydroxide and gives a lower alkalinity to the spray solution, the greatest alkalinity not being attended by the greatest evolution of nicotine. Bordeaux mixture and lime-sulphur are good liberators of nicotine, 96.75 percent of nicotine being evolved in 24 hours from a 1 to 100 nicotine sulphate in 4:4:50 bordeaux mixture, and 70.84 percent in 1 to 40 lime-sulphur, as compared with 100 percent by the addition of sal soda at twice the strength necessary to neutralize the nicotine sulphate and 28.78 percent with no liberator. Tests carried out against insects showed that the use of liberators may allow a reduction of the amount of nicotine required to kill in certain cases. This is accomplished by the increased concentration of the nicotine in the atmosphere surrounding the insects by more rapid evolution of the nicotine fumes.

Against Myzus persicae Sulz., a dilution of 1 to 2,500 nicotine sulphate with potash fish-oil soap gave 95 percent control, whereas 1 to 1,200 with no liberator gave only 94 percent control. Against Aphis pomi DeG., nicotine sulphate along at 1 to 1,200 was little better than at 1 to 2,000 with lime-sulphur, while the addition of sal soda to the regular orchard combination spray appears to make nicotine sulphate perfectly effective against this aphid at 1 to 2,000. At the rate used in these tests, a 100 gal. tank of 40-percent nicotine sulphate at 1 to 1,000 requires 8 oz. sal soda or 1.5 pt. potash fish-oil soap. The average percentage of control secured against moths (Melittia satyriniformis Hb.) with nicotine sulphate (1 to 250) alone was 73 percent and with a 1 to 500 solution and fish-oil soap, 80 percent, no control being obtained with a 1 to 500 solution with the addition of sal soda. The failure of the latter was probably due to the extremely swift evolution of nicotine, which dissipated the poison before it could penetrate into the eggs, while fish-oil soap not only increased the evolution of nicotine, but favorably affected the physical nature of the film spray, which spread, and stuck and dried over the eggs, thus aiding the penetration of the poison.

BONDAROVICH, M. G. (2078)

1929. TOBACCO DUST AS AN INSECTICIDE. Kharkov. Oblastn. S.-Kh. Opuita Stantz. Ent. Dept. No. 11, 8 pp. [In Russian. Abstract in Rev. Appl. Ent. (A) 18: 90. 1930.]

Laboratory experiments with dust from Nicotiana rustica against Phyllotreta cruciferae Goeze are described. A tobacco extract spray containing 0.3 percent nicotine applied to a cabbage leaf which was subsequently dried for an hour and placed in a jar containing flea beetles paralyzed them in 15 minutes. Applied undiluted, tobacco dust was very effective in protecting radish and cabbage seedlings against Phyllotreta spp. but it proved of little value against lepidopterous larvae and various Rhynchota or against Bruchus pisorum on peas.

ANONYMOUS (2079)

1930. PHILIPPINE ISLANDS DEPARTMENT OF AGRICULTURE. BUREAU OF PLANT INDUSTRY. ADMINISTRATIVE ORDER NO. 2. Philippine Jour. Agr. 1 (1): 135-138. [Abstract in Rev. Appl. Ent. (A) 18: 652. 1930.]

Spraying with soap solution at the rate of 1/4 to 1/2 lb. to 4 gal. water, preferably with the addition of nicotine sulphate is enjoined for the control of Promecotheca cumingi Baly, a pest of coconuts.

DAVIDSON, W. M. (2080)

1930. ROTENONE AS A CONTACT INSECTICIDE. Jour. Econ. Ent. 23: 868-874. [Abstract in Rev. Appl. Ent. (A) 19: 101. 1931.]

In suspensions, rotenone proved valuable against such soft-bodied insects as aphids, thrips, leafhoppers, and larvae of Coleoptera and Lepidoptera. When freshly dispersed in water by dilution of an acetone solution (4 g. rotenone to 100 cc. acetone), rotenone is effective against Aphis rumicis L. at a concentration of 1 to 200,000, or about one-fifteenth of that at which nicotine is effective.

FELT, E. P., and BROMLEY, S. W. (2081)

1930. SHADE TREE INSECTS IN 1929. Jour. Econ. Ent. 23: 137-142. [Abstract in Rev. Appl. Ent. (A) 18: 395. 1930.]

Spraying with a nicotine-molasses-soap combination in May apparently gives excellent control of the Norway maple leaf stem miner (Nepticula sericopeza Zell.). Pachypsylla celtidesmamma Riley and P. celtidis-gemma Riley commonly produce galls on hackberry (Celtis occidentalis). The former is readily controlled with a nicotine-molasses spray applied about the middle of May and the latter with the same materials applied about June 10. This insecticide kills many adults and apparently destroys the eggs.

PARROTT, P. J., and GLASGOW, H. (2082)

1930. THE ROSY APHID IN RELATION TO SPRAY PRACTICES IN 1929. N.Y. Agr. Expt. Sta. No. 582, 32pp., illus. [Abstract in Rev. Appl. Ent. (A) 18: 446. 1930.]

The lime-sulphur and nicotine sulphate spray (Rev. Appl. Ent. (A) 16: 459) proved preferable to any other tried for the control of the rosy aphid (Anuraphis roseus Baker). If the lime-sulphur is used at the rate of 1 to 8 or 1 to 11, coccids and the woolly aphid (Eriosoma lanigerum Hausm.) will also be controlled.

DARLEY, M. M. (2083)

1931. SOME COMPARATIVE TESTS WITH ROTENONE, NICOTINE AND PYRETHRUM. Jour. Econ. Ent. 24: 111-115. [Abstract in Rev. Appl. Ent. (A) 19: 345. 1931.]

Rotenone (1 to 100,000) as a contact poison in spray form, was found to compare favorably with nicotine (1 to 10,000) and pyrethrins (1 to 74,800), with penetrol at the same concentration (1 to 200) in each spray, in tests against the false cabbage aphid (Aphis pseudobrassicae Davis) in the field and the spiraea aphid (Aphis spiraecola Patch) in the laboratory.

Against adult spotted cucumber beetles (Diabrotica duodecimpunctata F.) and Mexican bean beetles (Epilachna varivesti Muls.)

pyrethrins (1 to 37,400) were effective, whereas nicotine (1 to 5,000) and rotenone (1 to 50,000) were ineffective, with penetrol (1 to 100) in each spray.

The relative toxicity of rotenone to the red spider (Tetranychus telarius L.) as compared with the toxicity of nicotine and pyrethrins, is appreciably greater than its relative toxicity as indicated in the aphid test.

FELT, E. P., and BROMLEY, S. W. (2084)

1931. INSECTICIDE INVESTIGATIONS DURING 1930. Jour. Econ. Ent. 24: 232-240. [Abstract in Rev. Appl. Ent. (A) 19: 355-356. 1931.]

Molasses nicotine soap sprays, which have proved effective in the control of the hackberry leaf gall psyllid (Pachypsylla celtidismamma Riley), the hackberry bud gall psyllid (P. celtidis-gemma Riley), the maple Nepticula (Nepticula sericopeza Zell.), and oak red spider (Paratetranychus bicolor Banks) were applied with safety to a series of 13 species of trees at a molasses dilution of 1 to 20. A series of sprays and dusts was tested for the control of the chinch bug (Blissus leucopterus Say), with potassium oleate plus nicotine appearing the most promising.

QUAINTANCE, A. L., and SIEGLER, E. H. (2085)

1931. INSECTICIDES, EQUIPMENT, AND METHODS FOR CONTROLLING ORCHARD INSECT PESTS. U. S. Dept. Agr. Farmers' Bull. 1666, 92 pp., illus.

Nicotine is briefly discussed (pp. 6, 24, 25, 59, 61, 66, 69, 70, 72, 75, 82, 84, 86, 89), but the information given is very similar to that stated by the same authors in 1918 (Ref. 2066), with the following exceptions: Nicotine dust is briefly described (p. 25). The apple aphids are Anuraphis roseus Baker, Aphis pomi DeG., and Rhopalosiphum prunifoliae Fitch (p. 66). The eye-spotted bud moth (Spilonota ocellana Schiff.) is a new addition to the list of insects controlled by nicotine (p. 69). Other minor changes in regard to generic names are also to be noted (pp. 83, 85).

SMITH, K. M. (2086)

1931. A TEXTBOOK OF AGRICULTURAL ENTOMOLOGY. Cambridge, 285 pp., illus.

Nicotine, in one form or another, is recommended against the following insects: Aphids (pp. 50, 60, 63, 66, 259); diamond-back moth, Plutella maculipennis Curtis (p. 91); asparagus beetle, Crioceris asparagi Linn. (p. 113); various flea beetles (p. 120); and various species of flies (pp. 202, 203, 222, 227, 234).

JACQUES, C. (2087)

1932. ENEMIES OF COCONUT PALMS IN NEW CALEDONIA. Rev. Agr. Nouvelle-Calédonie, p. 903-909, illus. [In French. Abstract in Rev. Appl. Ent. (A) 21: 150. 1933.]

The hispid (*Brontispa froggatti* Sharp) may be controlled by shaking a suspension of lead arsenate or nicotine and soap solution into the heart of the leaves of affected trees from a bottle with a perforated cork.

BARBIERI, N. A. (2088)

1933. TABACIN OR THE TOXIC PRINCIPLE OF TOBACCO. THE INSECTICIDAL ACTION OF TABACOL. Rend. Accad. Naz. Lincei, Cl. Sci. Fis. e Mat. Nat. (6) VII, pp. 764-768; XVII, No. 5, pp. 402-409, illus. [Rome] 1928 and 1933. [In Italian. Abstract in Rev. Appl. Ent. (A) 21: 630. 1933.]

The first of these papers describes methods of analyzing tobacco. One of the fractions obtained contains tabacin, a glucoside with a distinct acid reaction, highly soluble in water or alcohol, but insoluble in ether. A 2 percent cold potash lye divides it into its components, tabacol, tabacinic acid, and sugar. At 110° C. tabacin produces irritant vapors of tabacol. When treated with a hot concentrated potash lye, tabacin loses a large amount of ammonia and changes into nicotine.

In the second paper the author considers tabacol to be an ideal insecticide, as it acts on the nervous system of insects, causing instant paralysis, and does not injure plants, even at 100 percent strength. It has an alkaline reaction and is highly soluble in water. Between 40° and 60° C it emits irritant, poisonous vapors. Insects (including *Lasioderma serricorne* F.), spiders and worms placed in a litre flask in which 1 cc. of tabacol had been vaporized were killed at once. A solution of 1 per mille may be used as a preventive spray, while one of 1 percent destroyed aphids. Within 1 minute, a 2 percent solution killed *Lepidosaphes pinnaeformis* Bch., *Heliothrips haemorrhoidalis* Bch., *Tetranychus telarius* L., *Aspidiotus hederae* Vall., and ants. Dipterous leaf-miners were killed by fumigation or by immersing the leaves for an hour in a 2 percent solution. In hot-houses, a 2 percent solution should be used as the tabacol left on the leaves after the water has evaporated prevents reinfestation for some time. A 1 percent solution injected into the soil killed worms without injury to the roots of plants. In experimental work in 1932 in France and Belgium and in 1933 in Italy, a 2 percent solution destroyed pests on a large number of plants without any injury to the foliage. Beet flies (*Pegonia hyoscyami*) as well as *Cecidomyia corallina* and their larvae are destroyed by exposure to the fumes for 1 hour.

5. Greenhouse Pests, 1885-1929

BOUCHÉ, J. (2089)

1885. INSEKTEN-VERTILGUNG DURCH VERDAMPFEN VON TABAKSAFT ODER VERBRENNE VON TABAKPAPIER. Jahrb. Gardenkunde u. Bot. 2: 447-448.

Aphids on greenhouse plants were fumigated by placing a particular tobacco juice over a low fire. This juice was a waste product, obtained from a tobacco factory, and was very rich in nicotine.

Greenhouse plants bearing aphids are fumigated with tobacco paper, which is being put on the market by the firm of Froebel of Zurich. This paper is a kind of cardboard, probably prepared with saltpetor and impregnated with tobacco juice.

ADAMS, R. (2090)

1904. TABAKSTAUB, EIN WOHLFEILES RÄUCHERMITTEL FÜR GEWÄCHSHAUSER. Gartenwelt 8 (27): 316-317.

Tobacco fumigation is recommended in Germany as a cheap and effective remedy for any kind of insect pests on plants in greenhouses. Tobacco dust, obtained from sweepings in tobacco factories, is heated on iron plates or on the heating pipes.

SANDERSON, E. D. (2091)

1906. NOTES FROM NEW HAMPSHIRE. U. S. Dept. Agr. Bur. Ent. Bull. 60, pp. 74-76.

The melon aphid (_Aphis_ _gossypii_ Glov.) is controlled very satisfactorily by fumigating houses with the "fumigating kind" of tobacco powder (p. 75).

R[ORA], L. (2092)

1907. FUMIGATION D'UNE SERRE À PÊCHERS. Tribune Hort. 2: 256.

The fumigation of greenhouse plants by burning tobacco stems and ribs is effective and is recommended in Belgium.

NÖEL, P. (2093)

1911. LE POU DU LAURIER-ROSE. Bull. Mens. Soc. Cent. Agr., Hort. et Acclim. Nice 51: 260-261.

Fumigation with tobacco is recommended for greenhouse plants infested with coccids (_Aspidiotus_ _nerii_). If tobacco juice (at 12° Baumé) is used, it can be evaporated on heated plates.

CHEVALIER, H. (2094)

1912. LE BOGONIA GLOIRE DE TORRAINE. Rev. Hort. Belge et Étrangère 38: 138-141.

Fumigate red spiders, thrips, and aphids on _Begonia_ in greenhouses by pouring tobacco extract on the hot water pipes or in shallow vessels on the hot pipes. A denser smoke may be obtained by piling up waste tobacco on the hot pipes. This tobacco should be sprinkled with water to keep it damp (p. 140).

WAHL, B. (2095)

1913. REMEDIES AGAINST APHIDS. Monatsh. Landw. Mitt. Pflanzenschutzstation [Wien], Reprint, 4pp. [In German. Abstract in Rev. Appl. Ent. (A) 1: 471. 1913.]

Among the remedies recommended are the following: (1) a good solution is made up of 3 lb. tobacco extract and 3 lb. soft soap, to 20 gal. water; (2) 2 to 3 lb. tobacco extract and 1/4 to 1/2 pt. lysol or demilysol in 20 gal. water; and (3) for fumigation in hot houses, tobacco powder is mixed with wood charcoal in a vessel and allowed to burn for 12 hours, or tobacco extract is steamed on hot iron plates, it being first of all diluted with twice its volume of water.

NOEL, P. (2096)

1914. LES PUCERONS DES SERRES ET LE TABAC NITRE. Jardinage 4 (30): 401-402, illus. [Abstract in Rev. Appl. Ent. (A) 2: 688. 1914]

Greenhouse aphids invariably succumb to the following treatment: Factory tobacco waste costing about 9 cents a pound is steeped for 1 hour in a cold concentrated solution of potassium nitrate and then dried in the sun. From 2 to 20 lb. of this product, according to the size of the greenhouse is placed in a flower pot in the center of the floor and set alight in the evening after all openings have been closed. The eggs will not be affected and a second fumigation is necessary 4 or 5 days later in order to destroy the newly hatched individuals before they have time to oviposit.

WHITMARSH, R. D. (2097)

1915. SOME IMPORTANT INSECT PESTS OF THE GREENHOUSE. Ohio Agr. Expt. Sta. Circ. 154, pp. 93-104, illus. [Abstract in Rev. Appl. Ent. (A) 3: 761-762. 1915.]

Nico-fume 1/2 pt. and lime-sulphur 2 qt. well mixed in 25 gal. water proved satisfactory against the red spider. Fumigation with Nico-fume sheets is advised against aphids, but all marketable blooms should first be gathered. The same method is satisfactory against mealybugs, or spraying with Nico-fume solution and soapy water, from 2 to 4 teaspoonfuls to the gal.

GEORGESON, C. C. (2098)

1916. REPORT OF THE ALASKA AGRICULTURAL EXPERIMENT STATIONS 1915. U. S. Dept. Agr. pp. 41-42. [Abstract in Rev. Appl. Ent. (A) 5: 189. 1917.]

A green aphid in greenhouses was controlled by fumigation with nicotine paper.

MOORE, Wm., and GRAHAM, S. A. (2099)

1917. A NEGLECTED FACTOR IN THE USE OF NICOTINE SULPHATE AS A SPRAY. Jour. Agr. Res. 10: 47-50. [Abstract in Rev. Appl. Ent. (A) 5: 449-450. 1917.]

Commercial tobacco extracts containing nicotine sulphate should not be applied on greenhouse plants intended for use as food, though tobacco extracts or tobacco papers containing free nicotine may be employed with safety. Plants so sprayed however should not be cut for the market until the day after spraying. Nicotine sulphate is non-volatile, but the alkali in soap used in the spraying mixture sets free the nicotine.

BARGE, J. (2100)

1921. L'EMPLOI DU JUS DE NICOTINE CONTRE LES INSECTES. Rev. Agr. Africa Nord 19 (104): 585. [Abstract in Rev. Appl. Ent. (A) 9: 475. 1921.]

A 1-percent solution of nicotine must be diluted with 5 to 10 times its volume in water. It is well to add a solution of 0.4 lb. commercial soda crystals and 2 lb. of soft black soap in 200 imperial gal. of water to every 20 gal. of the weaker solution. For certain larvae and the more resistant aphids about 1 1/2 pt. of methylated spirits should also be added. For fumigation in greenhouses nicotine extract (10 percent nicotine) should be diluted by 5 times only its volume in water, adding 2 lb. soda crystals per gal. of extract. The liquid is heated in a boiler and then sprinkled on bricks or iron sheets heated to a high temperature. The fumes should be allowed to act for several hours. Nicotine solutions are said to be very efficacious in curing mange in animals. For sheep a lotion is made containing 0.12 or 0.13 percent of nicotine; to this is added a weight of soda crystals double the weight of the pure nicotine [R.A.E. (B) 9: 164. 1921.].

PETERSON, A. (2101)

1921. THE STRAWBERRY ROOT-WORM, A SERIOUS PEST ON ROSES IN THE GREENHOUSE. N. J. Agr. Expt. Sta. Rept. 1919-20, pp. 468-493, illus. [Abstract in Rev. Appl. Ent. (A) 10: 246. 1922.]

Varying strengths of nicotine up to 4 cc. to 1 l. of water were used with very little success for the control of the strawberry rootworm (Typophorus canellus).

PARKER, T. (2102)

1923. THE SUPPRESSION OF INSECT PESTS AND FUNGOID DISEASES. 2. THE FUMIGATION AND DISINFECTION OF GLASSHOUSES. Bur. Bio-Tech. Bull. 8, pp. 244-248. [Abstract in Rev. Appl. Ent. (A) 11: 177. 1923.]

It is considered doubtful whether cyanide gas, nicotine, and the commoner fumigants are effective in killing both hibernating insects and their eggs.

PARKER, T. (2103)

1923. THE SUPPRESSION OF INSECT PESTS AND FUNGOID DISEASES. 3. THE FUMIGATION OF COMMERCIAL GLASSHOUSES IN THE GROWING SEASON. Bull. Bur. Bio-Tech. ii, 9 pp. 21-26. [Abstract in Rev. Appl. Ent. (A) 11: 307. 1923.]

Against aphids nicotine is the most effective medium for use under glass. It should be applied as a dust with a special vaporizer, as owing to the high boiling point of the liquid its rate of evaporation in an ordinary hothouse is much too slow to be effective. Reference is made to the burning of paper impregnated with nicotine.

WEIGEL, C. A., and SASSCER, E. R. (2104)

1923. INSECTS INJURIOUS TO ORNAMENTAL GREENHOUSE PLANTS. U. S. Dept. Agr. Farmers' Bull. 1362, 81 pp., illus.

Tobacco extracts or nicotine solutions are very generally used for the control of many soft-bodied sucking insects. The volatile or "free" nicotine as a liquid is largely used for fumigation by painting it on the hot steam pipes or by vaporizing it over lamps. Non-volatile nicotine solutions, made from 40 percent nicotine sulphate, are also briefly described (p. 6). Nicotine oleate and kerosene nicotine oleate are briefly discussed (pp. 6-7). Tobacco dust and nicotine dust are described (pp. 8-9).

Tobacco fumigation is employed by florists for the control of plant lice, thrips, and whiteflies, when it is not convenient to use hydrocyanic acid gas. Tobacco stems have been used extensively in the past but have now been discarded because of the difficulty surrounding their use. At present the burning of standard tobacco papers or the painting of one or more hot steam pipes with volatile nicotine solutions is a very convenient and efficient method of producing a smudge (p. 12).

Tobacco, in one or more forms, is used against the following insects found in greenhouses: Whitefly (Trialeurodes vaporariorum Westw.) - 40-percent nicotine solution or nicotine oleate may be employed, preferably preceded by one or two tobacco fumigations (p. 21). Narcissus or daffodil fly (Merodon equestris Fab.), lesser bulb fly (Eumerus strigatus Fallen), and bulb mites (Rhizoglyphus hyacinthi Boisd. and R. rhizophagus Banks) - immerse bulbs in solution of 40 percent nicotine-sulphate (1 to 400) or nicotine oleate (pp. 22, 23, 25) heated to 122° F.

Onion thrips (Thrips tabaci Lind.) - tobacco smudges produced from nicotine solution or preparations impregnated with it; spraying with nicotine solutions; or dusting with either superfine tobacco dust or nicotine dust (p. 28).

Chrysanthemum midge (Diarthronomyia hypogaea Löw) - nightly fumigation with tobacco papers, or spray with nicotine solutions (p. 32).

Marguerite fly (*Phytomyza chrysanthemi* Kowarz) and burdock leaf-miner (*Agromyza maculosa* Malloch) - spray with nicotine sulphate, free nicotine (1 to 500), or nicotine oleate (p. 33).

Mealybugs (*Pseudococcus citri* Risso, *P. adonidum* L. and *Orthezia insignis* Dougl.) - Spray, using nicotine oleate, kerosene nicotine oleate or other nicotine solutions (pp.38, 39).

Greenhouse thrips (*Heliothrips haemorrhoidalis* Bouché) - tobacco smudges, or dusting with tobacco dust and nicotine dust (p. 40).

Cyclamen mite (*Tarsonemus pallidus* Banks) - spray or dip plants in nicotine solution (1 to 800) or nicotine oleate (p. 41).

Fickle midge (*Sciara inconstans* Fab.) - apply tobacco dust to soil and use tobacco smudges (p. 48).

Cattleya fly (*Eurytoma orchidearum* Westw.) - solutions of 40-percent nicotine sulphate (p. 49).

Orchid plant-bug (*Tenthecoris bicolor* Scatt.) - spray with nicotine sulphate or nicotine oleate (p. 52).

Proteus scale (*Parlatoria proteus* Curt.), other scales, and palm aphid (*Cerataphis lataniae* Boisd.) - spray or dip plants in kerosene nicotine oleate (pp.53, 56).

Rose midge (*Dasyneura rhodophaga* Coq.) - fumigate with nicotine or tobacco fumes and also keep soil covered with a layer of tobacco dust, and spray with kerosene nicotine oleate (p. 59).

Strawberry rootworm or leaf-beetle (*Paria canella* var. *quadrinotata* Say and *gilvipes* Crotch) - apply tobacco dust to the soil (p. 61).

Red spider (*Tetranychus telarius* L.) - spray with nicotine solutions and nicotine oleate (p. 63).

Rose aphids (*Macrosiphum rosae* L. and *Myzus rosarum* Kalt.) - fumigate, spray, and dust with nicotine preparations (p.66).

Fuller's rose beetle (*Pantomorus fulleri* Horn) - apply tobacco stems or dust to soil (p. 68).

Plant-bugs (*Lygus pratensis* L., *Poecilocapsus lineatus* Fab., and *Adelphocoris rapidus* Say) - spray with tobacco solutions, or dust with lime-nicotine dust (pp.71, 72).

Ants - spray the walks, the soil under the pots and benches, and the woodwork with kerosene nicotine oleate (p. 72).

Termites - soak the ashes or sand under the pots or infested benches with kerosene nicotine oleate (p. 73).

"Sowbugs" or "pillbugs" - use tobacco dust as a repellent, and spray with kerosene nicotine oleate under benches and on walks (p. 74).

Earthworms - tobacco dust worked into soil will prove effective (p. 75).

DOOLITTLE, S. P. (2105)

1924. CONTROL OF CUCUMBER MOSAIC IN THE GREENHOUSE. U. S. Dept. Agr. Dept. Circ. 321, 5 pp., illus. [Abstract in Rev. Appl. Ent. (A) 13: 274-275. 1925.]

For the control of insects transmitting cucumber mosaic (- particularly the melon aphis, Aphis gossypii Glov., and the striped cucumber beetle, Diabrotica vittata F.,) it is advisable to fumigate the greenhouse at intervals of 10 days through the growing season. Tobacco dust, nicotine paper, or hydrocyanic acid give good results.

GUBA, E. F. (2106)

1926. INJURY TO GLASSHOUSE PLANTS FROM HYDROCYANIC ACID GAS FOLLOWING THE APPLICATION OF COPPER FUNGICIDES. Phytopath. 16 (9): 633-634. [Abstract in Rev. Appl. Ent. (A) 15: 3. 1927.]

Tobacco fumigants should be used instead of cyanide.

ZÖPPIG, F. (2107)

1926. PESTS AND DISEASES OF CYCLAMENS AND THEIR CONTROL, Kranke Pflanze 3 (11): 202-205. [In German. Abstract in Rev. Appl. Ent. (A) 15: 54. 1927.]

If the plants are not in flower, aphids and thrips may be destroyed by dipping in a decoction of tobacco; otherwise the greenhouses should be fumigated with tobacco.

DELGADO DE TORRES, D. (2108)

1927. EXPERIMENTS ON THE ACTION OF NICOTINE ON INSECTS AND ITS USE IN HOTHOUSES AS AN INSECTICIDE. Bol. Pat. Veg. Ent. Agr. 2 (8-9): 113-120. [Abstract in Rev. Appl. Ent. 16: 577. 1928.]

A brief survey is given of the methods of using nicotine against insects. A dust containing 12.5 percent nicotine burnt in a greenhouse at the rate of 0.215 g. of pure nicotine per cubic meter killed Macrosiphum sanborni Gill, but was only partially satisfactory against Heliothrips femoralis Reut. and Trialeurodes vaporariorum Westw. The fatal dose for the thrips was twice that required for the aphid. Pseudococcus citri Risso and larvae of Lepidoptera are very resistant to nicotine. The experiments in greenhouse fumigation were made in the United States.

GRISWOLD, G. H. (2109)

1927. THE CONTROL OF APHIDS ON HOUSE PLANTS. Cornell Ext. Bull. 162, 15 pp., illus. [Abstract in Rev. Appl. Ent. (A) 16: 406. 1928.]

A solution of 1/4 teaspoonful nicotine sulphate and 1/4 oz. soap to 1 qt. water has proved very successful for dipping the plants or as a spray. After treatment the plants should be placed on their sides to drain and on the following day they should be dipped in clear water or sprayed with it to wash off the insecticide. The simplest remedy is a 2 percent free nicotine dust which kills 90 to 100 percent within a short time. The plants before treatment should be covered with a cloth thrown over small stakes driven into the soil, the hand duster being inserted under the cloth so that the dust will reach the lower surface of the leaves. The cloth may be removed in 10 or 15 minutes when the dust will all have settled on the plants.

KELLERMANN, W. (2110)

1927. SCHÄDLINGSBEKÄMPFUNG IN ROSENHÄUSERN. Gartenwelt 31: 258-259.

Various insecticides with a nicotine base are used as spray or fumigant against aphids. In case of fumigation the aphids often fall to the ground where they recover. It is therefore customary in certain florists' establishments to spray the plants and to wash the floor with a soap solution of 1.5 kg. soft soap and 1 l. alcohol in 100 l. water.

THEOBALD, F. V. (2111)

1927. CATERPILLARS AND PLANT LICE ATTACKING CHRYSANTHEMUMS UNDER GLASS. Jour. So. East. Agr. Coll. Wye, No. 24, pp. 44-50, illus. [Kent] [Abstract in Rev. Appl. Ent. (A) 15: 578. 1927.]

Several species of aphids are enumerated. If the houses are not too wide the plants should be sprayed with nicotine and soft soap before they flower; when they are in flower it is best to fumigate at intervals with tobacco shreds.

HÜLSENBERG (2112)

1928. EXPERIMENTS WITH CALCIUM CYANIDE FOR THE CONTROL OF GREENHOUSE PESTS. Ztschr. Angew. Ent. 14 (2): 285-315, illus. [In German. Abstract in Rev. Appl. Ent. (A) 17: 206. 1929.]

In some cases the value of cyanide fumigation in greenhouses is greatly increased if it is followed by nicotine fumigation, using a comparatively low concentration of the latter.

OHLERS, H. (2113)

1928. FUMIGATION EXPERIMENTS IN GLASSHOUSES WITH VARIOUS NICOTINE PREPARATIONS. Gartner-Tidende, reprint, 12 pp., illus. [Abstract in Rev. Appl. Ent. (A) 17: 260. 1929.]

An account is given of a number of experiments in greenhouses fumigation in which 14 different nicotine preparations in liquid, strip, and powder form were used against aphids, whiteflies, thrips, coccids, and mites.

WHITCOMB, W. D., and GUBA, E. F. (2114)

1928. CONTROL OF RED SPIDER AND POWDERY MILDEW ON GREENHOUSE CUCUMBERS. Mass. Agr. Expt. Sta. Bull. 246, pp. 280-294, illus. [Abstract in Rev. Appl. Ent. (A) 17: 311-312. 1929.]

When aphids or thrips are present in connection with red spider, the addition of 1 pt. 40-percent nicotine sulphate or 40-percent free nicotine liquid in 100 gal. of diluted white oil emulsion will control all these pests, and if mildew is present, bordeaux mixture or other copper sulphate sprays may safely be mixed with the oil-nicotine or with the oil spray.

HERRICK, G. W., and GRISWOLD, G. H. (2115)

1929. THE FUMIGATION OF GREENHOUSES TO DESTROY INSECT PESTS. Cornell Agr. Expt. Sta. Bull. 474, 20 pp., illus. [Abstract in Rev. Appl. Ent. (A) 17: 367. 1929.]

Methods of fumigating greenhouses with nicotine products both in liquid and powder forms against aphids are described.

6. Millipedes and Centipedes, 1917-1925.

CORY, E. N., and O'NEILL, F. H. (2116)

1917. THE HOTHOUSE MILLIPED. Md. Agr. Expt. Sta. Bull. 206, 12 pp., illus. [Abstract in Rev. Appl. Ent. (A) 5: 459-460. 1917.]

For the control of the hothouse millipede (Oxidus gracilis Koch) tobacco dust sprinkled at the rate of 300 lb. per acre - or 1 oz. per square yard - proved fairly effective, killing about 85 percent of the millipedes on the beds and about 5 percent under the surface. Nicotine (40-percent) and nicotine sulphate (40-percent) also give good results if the soil is well drenched.

FEYTAUD, J. (2117)

1920. LE PROCES D'UN MYRIAPODE: LE BLANIULE MOUCHETE. Bull. Soc. Étude Vulg. Zool. Agr. [Bordeaux] 19 (5): 33-35. [Abstract in Rev. Appl. Ent. (A) 8: 369. 1920.]

The millipede Blaniulus guttulatus Bose can be checked by sprinkling the soil before sowing with tobacco extract.

HORSFALL, J. L., and EYER, J. R. (2118)

1921. PRELIMINARY NOTES ON CONTROL OF MILLIPEDES UNDER SASH. Jour. Econ. Ent. 14: 269-272. [Abstract in Rev. Appl. Ent. (A) 10: 44. 1922.]

The use of Nicotine sulphate 1 part in 200 of water sprinkled on a newly seeded bed resulted in an increase of 224 plants (tomato seedlings, carrots and lettuce) over the untreated beds; 2 percent nicotine sulphate as a dust increased the stand by 144 plants.

ANONYMOUS (2119)

1925. ZOOLOGY AND ENTOMOLOGY. Pa. Agr. Expt. Sta. Ann. Rept. 38 (1924-1925). Bull. 196, pp. 32-33. [Abstract in Rev. Appl. Ent. (A) 13: 634-635. 1925.]

Various materials -- miscible oil, calcium caseinate, skim milk powder, and powdered glue -- have been tested to see if they could replace soap as a spreader in liquid nicotine spray against aphids. Without lime, all the materials tested were inferior to fish-oil soap, but with the addition of lime they either equalled or exceeded the soap standard. Satisfactory remedies against millipedes in lettuce cold frames included nicotine sulphate in water, (1:500) applied at the rate of 1 gal to 2 1/2 sq. ft. and 2 percent home-mixed nicotine dust worked into the soil a week before sowing.

WYMORE, F. H. (2120)

1924. THE GARDEN CENTIPEDE, SCUTIGERELLA IMMACULATA (NEWPORT), A PEST OF ECONOMIC IMPORTANCE IN THE WEST. Jour. Econ. Ent. 17: 520-526.

Tobacco dust was tried as a repellent in California. It was applied at the bases of asparagus plants and covered with dirt. It had no apparent repelling effect on this centipede (p. 526).

P. HOW NICOTINE KILLS, REACTIONS, SYMPTOMS, MINIMUM DOSAGE, ETC., 1900-1934.

GUERCIO, G. DEL (2121)

1900. THE KILLING POWER OF NICOTINE SOLUTIONS AND ITS USE IN THE DESTRUCTION OF INSECTS. Nuove Relaz. R. Staz. Ent. Agr. [Florence] 1st ser., No. 3, pp. 124-134. [In Italian.]

In the laboratory in Italy a series of tests was conducted with silkworms (Bombyx mori L.) in 1895, 1896, and 1897 by spraying and dipping the insects in nicotine solutions ranging from 10 to 0.01 percent. A 10 percent solution of pure nicotine paralyzes the larvae in less than 1 minute. Solutions from 7 to 3 percent also rendered them unable to walk in a few seconds; they drop on the side and bend their body. If treated with 2 to 1 percent solutions they raise their heads, tremble, and die in 8 to 10 minutes. In all cases death is preceded by vomiting and convulsions of the prolegs.

Laboratory tests with pure nicotine solutions, and nicotine solutions to which alkalies and acid has been added showed no remarkable difference in effect between the pure solutions and alkaline solutions, but the acidulated solutions killed less quickly. When nicotine and soap are combined, the nicotine acts as a fumigant, causing irritation and asphyxiation, while the soap penetrates in its liquid condition into the respiratory channels of the insects, clogging them and choking the insects. The two substances combined in water form a mixture which unites the good qualities of both and in addition contributes adhesiveness to the nicotine, causing it to spread more evenly and to remain some time. The solution used consisted of 1 g. nicotine, 15 to 25 g. soap and 2,000 cc. water.

MICHALSKY, W. (2122)

1905. ON THE EFFECT OF CERTAIN ALKALOIDS UPON COCKROACHES. Krakow Rozprawy Matematuczno-Przyrodniczego Akad. Umiej. 45 (B): 378-379. [In Polish.]

A solution of 8-4 and 1 percent of nicotine injected under the tegument of cockroaches produced an immediate paralyzation and complete absence of motion. One second later the insect has a strong convulsion lasting for three seconds, and then it is absolutely motionless. If still alive this may be ascertained only by a touch of the antennae. Nicotine in a concentration of 0.5 percent causes a similar effect; however, the insect will not perish and remains alive for 27 days, but always paralyzed. A solution of 0.125 percent produces a convulsion, beginning with the hind legs and proceeding to the front legs, after which they become motionless for a little while, but on the next day they were found normal. If any of the aforesaid concentration is injected into the anus it causes general weakness and paralysis of the legs. The lethal dose for dogs is 1/2 drop, for rabbits 1/4 drop. Nicotine is relatively more toxic to the higher animals than it is to certain insects.

PICKETT, B. S. (2123)

1907. STANDARD SPRAY MIXTURES. Ill. Hort. Soc. 35th Ann. Conv., Trans. for 1907, p. 375-391.

Tobacco decoction is briefly described, and is classified as one of the suffocating sprays (p. 382-384), which suffocate insects by closing their breathing pores.

CAPUS, J., and FEYTAUD, J. (2124)

1909. LES TRAITEMENTS INSECTICIDES CONTRES LES CHENILLES FILEUSES DES ARBRES FRUITIERS. Rev. Vitic. 32; 313-319.

Spray solutions, containing titrated nicotine solutions ranging from 1.3 to 2 l. per 100 l. of water or bordeaux mixture, were tested on tent caterpillars in fruit trees. The bordeaux-nicotine mixture acts as a powerful poison, for the caterpillars remain motionless but do not die soon. In a mixed treatment a 2-percent solution killed all the caterpillars within 3 days. Nicotine acts in a very effective way, and its effect seems to be more rapid by contact than by ingestion, as it has a repellent effect.

FEYTAUD, J. (2125)

1910. LA QUESTION DE LA NICOTINE. Bull. Soc. Étude et Vulg. Zool. Agr. 9 (5): 143-147.

This is a brief discussion of the literature, including the knowledge gained by the author.

Nicotine, being very volatile, repels by its odor and thus plays an important role as an insectifuge. Its caustic nature causes burns, if brought in contact with the integument of insects. Its fumes are asphyxiating and pass into the respiratory organs through the spiracles, and thus kill insects by a mechanical and chemical asphyxiation. Finally its toxic action is slower, but surely fatal, when it is absorbed by the digestive organs.

CAZENEUVE, P. (2126)

1911. ZUR L'INEFFICACITÉ DE L'ARSÉNIATE DE PLOMB. Rev. Vitic. 36: 349-355.

Adult larvae of _Eudemis_ were placed on a piece of blotting paper and a drop or two of titrated nicotine dropped on them, they wriggled vehemently to shake off the liquid. The caterpillars thus treated pupated and produced normal adult moths.

SHAFER, G. D. (2127)

1911. HOW CONTACT INSECTICIDES KILL. Mich. Agr. Expt. Sta. Tech. Bull. 11, 65 pp., illus.

It was ascertained that insects subjected to the vapors of nicotine (To-bak-ine) first pass through a stage of excitement, then through a stage of depression in which the coordination of movement is uncertain, and finally through a stage in which there is total loss of movement and sensibility. The last stage is followed more or less rapidly by death. (p. 19).

MAISONNEUVE, P. (2128)

1912. LA LUTTE CONTRE LA COCHYLIS EN ANJOU EN 1911. Rev. Vitic. 37: 371-377.

Several small scale tests were conducted with nicotine to show that it has remarkable insecticidal effects and that it can kill insects without them eating the poisoned food.

MARCHAL, P. (2129)

1912(?) REPORT ON THE RESULTS OBTAINED BY THE COMMISSION FOR THE STUDY OF COCHYLIS AND EUDEMIS DURING THE YEAR 1911. 326 pp., illus. [In French. Abstract in Rev. Appl. Ent. (A) 1: 70-73. 1913.]

The most effective sprays against cochylis (*Clysia ambiguella*) and Eudemis (*Polychrosis botrana*) are preparations of nicotine and particularly bordeaux mixture combined with nicotine. Thirteen-hundredths percent of the pure alkaloid will destroy a very large percentage of eggs by killing the embryo just as it is about to emerge and the action will hold good for 6 or 7 days after the application of the spray. Young caterpillars on bunches previously treated with a solution of nicotine of the same strength die in great numbers even 5 or 6 days after spraying, this being probably due to the ingestion of the liquid and the inhalation of the vapor given off. Nicotine solution (0.13 and 0.15 percent) produces a great mortality among caterpillars when applied directly especially if they are in an early stage of their growth, this direct action is much more powerful in the case of *Polychrosis* than in that of *Clysia* and this appears to be true also of all external insecticides.

Soap and treacle greatly assist the efficacy of nicotine sprays.

MARCHAL, F. (2130)

1912. ÉTUDE SUR LA COCHYLIS ET L'EUDÉMIS. Prog. Agr. et Vitic. 57: 260 266.

Feytaud's results on the action of nicotine are cited, showing that nicotine aborts the eggs of the vine moths.

The author treated a large number of these eggs with pure nicotine solutions (1.3 percent and 1.5 percent nicotine) and determined that the embryos continued to develop, but they died at the moment of hatching.

FIXMER, F. (2131)

1913. THE CONTROL OF THE VINE MOTH IN THE LUXEMBURG VINE-GROWING DISTRICT. Luxemburger Weinztg. 1 (21): 351-355, illus. July 1. [In German. Abstract in Rev. Appl. Ent. (A) 1: 332. 1913.]

Nicotine has proved to be the most satisfactory spray for the control of *Clysia ambiguella*, partly because it asphyxiates the moths on the wing and partly on account of its value as a stomach poison. Best results are obtained by spraying when the moths are most numerous. A spray containing 1.33 kilograms of nicotine in 100 l. of bordeaux mixture, or, if greater wetting power is desirable, 1.5 percent nicotine and 1.5 percent soft soap, may reduce the ravages of the pest to a negligible quantity.

VINET, E. (2132)

1913. INSECTICIDES IN VITICULTURE; ESPECIALLY AGAINST CLYSIA AMBIGUELLA, POLYCHROSIS BOTRANA, HALTICA, AND THE CIGARETTE BEETLE. Bull. Soc. Agr. France, pp. 357-363. [In French. Abstract in Rev. Appl. Ent. (A) 1: 311-312. 1913.]

Internal arsenical and nicotine poisons employed against vine moths may act on the adult insect, larvae, or eggs. Against the adults they are insectifuges, and their chief effect is to reduce oviposition, this being especially marked when nicotine is used; whereas against the cigarette beetle and Haltica lead arsenate is much superior. Bordeaux mixture is said to kill the eggs, but nicotine has unquestionably a very definite abortive action. Nicotine acts sometimes as a contact and sometimes as a stomach poison against the larvae. One or two sprays with nicotine destroyed 70 to 80 percent, and the larvae that survived developed normally and committed the usual amount of destruction; whereas a very similar, but more uniform, result was obtained with lead arsenate and the larvae which escaped the poison never developed properly.

SCHWARTZ (2133)

1913. NICOTINE AS AN INSECT POISON. Mitt. K. Biol. Anst. Land u. Forstw. 8: 36-37. [In German. Abstract in Rev. Appl. Ent. (A) 2: 50. 1914.]

Laboratory tests were made to ascertain the effect of nicotine and its salts upon insects. Besides pure nicotine the following salts of it were used: Lactate, acetate, trichloracetate, and nitrate. All of these substances, in 0.015 percent solution, acted as a skin poison on aphids (Rhopalosiphum ribis). Solutions containing 0.025 percent of the substance killed 93 to 98 percent of the aphids. As an internal poison, 0.05 percent solutions were effective on 3 species of caterpillars, Vanessa polychloros, V. io, and Orgyia antiqua; and 0.2 percent solutions on 2 other species of caterpillars, (Lymantria Porthetria dispar and Stilpnotia salicis; and 1 percent solutions on Malacosoma neutria. Poisoned food affected only two of the first-mentioned species (Vanessa io and V. polychloros). In the cases where the caterpillars of these species ate leaves sprayed with nicotine compounds, they pupated imperfectly, and in no cases were butterflies produced from them. The spray solution used was 0.05 percent in strength. The difference in action of the several compounds of nicotine used was not determined.

DOBRODEEV, A. I. (2134)

1915. CLYSIA AMBIGUELLA HB. AND POLYCHROSIS BOTRANA SCHIFF. AND METHODS OF CONTROLLING THEM ACCORDING TO THE LATEST RESEARCHES. Mem. Bur. Ent. Sci. Com. Cent. Bd. Land Admin. and Agr. [Petrograd] 11 No. 5, 37 pp. [In Russian. Abstract in Rev. Appl. Ent. (A) 3: 209-212. 1915.]

Nicotine destroys the eggs and acts also through the skin of the caterpillars.

FEYTAUD, J. (2135)

1915. INVESTIGATIONS ON POLYCHROSIS BOTRANA AND CLYSIA AMBIGUELLA IN THE BORDELAIS IN 1913. Ann. Serv. Epiphyties 2 (1913): 109-152, illus. [Abstract in Rev. Appl. Ent. (A) 4: 299-300. 1916.]

The remarkable aborting action of nicotine on the eggs of Polychrosis botrana (cf. Rev. Appl. Ent. (A) 2: 410] is due to an internal insecticidal action on the developing caterpillars.

Tests of insecticides in experimental plots confirmed the great efficiency of nicotine-bordeaux mixture and of wetting nicotine solutions, the high efficiency of pyrethrum, the lessened effectiveness of nicotine mixed with lime and the inferiority of pyridine to nicotine. In the treatment of large vineyards nicotined bordeaux mixture saved a much greater value in grapes than the cost of this preventive treatment.

MOLINAS, E. (2136)

1915. LES INSECTICIDES EN HORTICULTURE. Jardin 28-29: 44-45. 1914-1915.

Each category of insects requires a special insecticidal treatment. Nicotine has the advantage over arsenical salts, of acting not only upon the digestive system but also upon the respiratory organs through the emanation of its fumes, which enter the respiratory opening (spiracles). One to 1 1/2 percent solutions of titrated nicotine suffice to destroy insects. An addition of soap increases its adhesiveness to the leaves of plants.

McINDOO, N. E. (2137)

1916. EFFECTS OF NICOTINE AS AN INSECTICIDE. Jour. Agr. Res. 7: 89-124, illus.

Pure nicotine fed to honeybees (Apis mellifica L.) causes death by paralysis, but more strictly by paresis, because paralysis includes both motor and sensory paralysis while paresis means only partial motor paralysis. The symptoms of nicotine poisoning are divided into three stages (pp. 90-92). Regardless of how it is applied, whenever nicotine kills insects, as well as all other animals, it kills by paralysis, which in insects travels along the ventral nerve cord from the abdomen to the brain (p. 120).

Aphids (Aphis populifoliae Davis), caterpillars (Ceratomia catalpae Bdv., Atteva aurea Fitch, Datana sp., Achroia grisella Fab., Thyridopteryx ephemeraeformis Haw.,) and beetles (Epicauta pennsylvanica DeG.) and honeybees were dipped into and sprayed with nicotine solutions. All the treated aphids died, but only a portion of the caterpillars and beetles succumbed, and bees could not be killed by spraying them (pp. 92-94).

Aphids, coccids, caterpillars, larvae of the Colorado potato beetle, houseflies, and honeybees were fumigated with pure nicotine and 40-percent nicotine sulphate. They were killed as usual by paralysis (pp. 94-95).

Other insects were subjected to the vapors from nicotine solutions and to the exhalations from the dried films of nicotine on sprayed leaves. Under the most favorable conditions insects were thus killed. (pp. 95-98).

By means of histological methods nicotine was traced as a stomach poison through the intestinal wall into the blood, and nicotine as a fumigant was traced through the spiracles into the tracheae and then to the central nervous system (pp. 106-113).

Nicotine spray solutions, without soap, do not pass into the tracheae, nor do they penetrate the integuments of insects. [In other papers] the author shows that soap solutions do enter the spiracles. The fumes from nicotine used as a fumigant, the vapors from nicotine spray solutions, and the odoriferous particles (exhalations) from evaporated nicotine spray solutions or from powdered tobacco pass into the tracheae and are widely distributed to all the tissues (p. 120).

The author does not know just how nicotine paralyzes the nervous system, but it prevents the nerve cells from functioning. A review of the literature shows that its presence around the cells causes the same structural changes resulting in death as observed when other simple animals of the same kind are deprived of oxygen. In such cases it seems to kill physically rather than chemically, but the evidence presented does not conclusively prove this view. In the higher animals it may kill by interfering with oxidation in the cells (p. 120).

FEYTAUD, J. (2138)

1917. THE ACTION OF INSECTICIDES ON THE EGGS OF POLYCHROSIS BOTRANA SCHIFF. Bull. Soc. Étude Vulg. Zool. Agr. 16 (9-10, 11-12): 97-105, 117-122. [In French. Abstract in Rev. Appl. Ent. (A) 6: 72-73. 1918.]

Nicotine destroys 80 percent of the eggs treated, and nicotine bordeaux mixture prevents the hatching of 88 percent of the eggs. Nicotine slowly poisons the developing larvae which die at the moment of hatching.

__________ (2139)

1917. RECHERCHES SUR L'EUDÈMIS ET LA COCHYLIS DANS LE BORDELAIS EN 1914. Ann. Serv. Epiphyties. 4 (1915): 218-265, illus. [Abstract in Rev. Appl. Ent. (A) 7: 457. 1919.]

Pyrethrum which only prevents development of 1/6 of the eggs of Polychrosis botrana had the same action as nicotine, the larva becoming poisoned at the moment by eating its way out of the egg.

McINDOO, N. E., and SIEVERS, A. F. (2140)

1917. QUASSIA EXTRACT AS A CONTACT INSECTICIDE. Jour. Agr. Res. 10: 497-531, illus.

Nicotine sulphate (40 percent) sprays were tested against aphids (*Macrosiphum liriodendri* Mon., *M. rosae* L., *Chaitophorus populicola* Thos., *Myzus persicae*, and *Aphis* sp.). The results show that nicotine sulphate acts very quickly, while quassia extract acts very slowly. The results also indicate that a shower 2 hours after the application of these insecticides does not affect the efficiency of the nicotine sulphate, while it greatly reduces the efficiency of quassia extract (pp. 515-518). Nicotine acts quickly, causes pronounced symptoms, and kills by paralysis (p. 528).

SAFRO, V. I. (2141)

1917. HOW TO TEST FOR THE PRESENCE OF NICOTINE ON SPRAYED PLANTS. Jour. Econ. Ent. 10: 459-461. [Abstract in Rev. Appl. Ent. (A) 6: 18-19. 1918.]

Tests confirmed the belief that nicotine may be present and continue to have some action for a considerable time after the spray had dried. On the sprayed foliage a film of nicotine remains which may still act as an insecticide.

TROOP, J., and MASON, P. W. (2142)

1917. SOME COMMON GARDEN INSECTS. Ind. Agr. Expt. Sta. Circ. 64, pp. 1-15, illus.

Under contact insecticides, nicotine sulphate and tobacco dust are briefly described (p. 14). The latter acts in two ways; it kills through the breathing pores, and it also acts as a repellent.

MOORE, Wm. (2143)

1918. OBSERVATIONS ON THE MODE OF ACTION OF CONTACT INSECTICIDES. Jour. Econ. Ent. 11 (6): 443-446. [Abstract in Rev. Appl. Ent. (A) 7: 115-116. 1919.]

Insecticides containing oil or soap may penetrate the tracheae of the insect thus preventing normal oxidation from taking place in the insect's body, with the result that the insect dies from their mechanical action alone. Nicotine may produce death by chemical action without materially influencing the intake of oxygen. The efficacy of free nicotine sprays is found to be increased sometimes by 50 percent by the addition of soap.

MOORE, Wm. and GRAHAM, S. A. (2144)

1918. PHYSICAL PROPERTIES GOVERNING THE EFFICACY OF CONTACT INSECTICIDES. Jour. Agr. Res. 13: 523-538. [Abstract in Rev. Appl. Ent. (A) 6: 397-398. 1918.]

Contact insecticides may be divided into two groups (1) those that wet but which do not spread, owing to their adhesion being less than their cohesion and (2) those that wet and spread over the surface and are able to gain entrance to the tracheae by capillarity since their cohesion is less than their adhesion. Aqueous solutions such as nicotine do not penetrate the tracheae at all except in the form of vapor. When nicotine sulphate comes in contact with the body of an insect it is slowly decomposed with the formation of nicotine which enters as a vapor.

PARFENTJEV, T. A. (2145)

1918. ON THE METHODS OF DESTRUCTION OF MOSQUITOES. Jour. Econ. Ent. 18 (6): 839-840, illus.

A series of tests on the use of tobacco smoke for destroying hibernating mosquitoes in Russia was conducted by burning tobacco powder (30 - 40 g. to 1 cubic meter). The powder was mixed with chopped hay and left to smolder in the room on iron sheets. The fumigation lasted 16 hours and usually all the mosquitoes were killed.

Mosquitoes, confined in bell-glasses, were also fumigated by using nicotine solutions. A time curve is used to show the results.

As to the symptoms of nicotine poisoning, the abdomens of some of the mosquitoes were abnormally extended; the same was true in the nicotinized cockroach (Stylopyga orientalis Lin.). The anterior intestine was also swollen.

REGAN, W. S. (2146)

1918. LATE DORMANT VERSUS DELAYED DORMANT OR GREEN TIP TREATMENT FOR THE CONTROL OF APPLE APHIDS. Mass. Agr. Expt. Sta., Bull. 184, pp. 47-57. [Abstract in Rev. Appl. Ent. (A) 7: 480-481. 1919.]

The application of lime-sulphur (1:8) and nicotine sulphate (1:800) combination applied at the delayed dormant period gives practically a perfect control for apple aphids. The action of nicotine sulphate is slow, and death appears to be due to paralysis.

SCHELLHASE (2147)

1921. UEBER DIE WIRKUNG VON ALKALOIDEN AUF INSEKTEN (HIPPOBOSCIDEN). Berlin Tierärztl. Wchnschr. 37: 325-329.

Tests made with a decoction of discarded cigarette-stubs in concentrations of 1 to 100 and 1 to 1000 resulted in a prompt paralyzation of the flies and subsequent death. Weaker concentrations (1:5000 - 1:100,000) produced cramps and violent action of the wings, which may be so strong that decapitated flies were able to fly away. Still weaker solutions (1:300,000 - 1:900,000) produced cramps, and rapid motion of the wings and of the legs.

CROZIER, W. J. (2148)

1922. "REVERSAL OF INHIBITION" BY ATROPINE, IN CATERPILLARS. Biol. Bull. 43 (4): 239-245.

Five large species of caterpillars (*Protoparce celeus*, *Samia cynthia*, *S. promethia*, *Automeris io*, and *Ceratomia catalpae*) were give injections by means of a hypodermic needle (p. 240).

In one or two cases transitory evidence of proleg reversal was obtained during observation of larvae injected with nicotine solutions. Ventralward contraction, especially at the anterior end, was always produced by nicotine. The larvae used agree in showing that 12 substances, including nicotine (1 to 500), caused a definite neuromuscular excitation 1/m evidenced by spontaneous writhings, often of definite pattern, or by temporarily heightened responsiveness, or both.

BECKER, R. (2149)

1923. DIE WIRKUNG VON ALKALOIDEN AUF FELDHENSCHRECKEN (ACRIDIDEN). Arch. Expt. Path. u. Pharm. 100: 335-348.

The heads of grasshoppers were cut off, the intestines pulled out, and the solutions of alkaloids were dropped from a pipette into the body cavity. Nicotine had a stimulating effect which was followed by a paralyzing one. The movements observed were mostly those of the hind legs, and known concentrations of the alkaloids were used. The author also describes a method of quantitatively injecting whole grasshoppers.

WIXFORTH, E. (2150)

1924. DER HERZSCHLAG DER CULICIDENLARVEN UNTER NATÜRLICHEN UND KÜNSTLICHEN BEDINGUNGEN. Arch. Naturgesch. 90: 193-240.

Nicotine, which in *Chordata* has a paralyzing effect upon the sympathetic ganglia cells of the heart after a short preceding stimulation, affects the heart of Culicidae larvae in the same way. A 0.1 percent nicotine solution increases at once the frequence of the heart beats (84.2 beats per minute) and causes great irregularities and diastolic arrest, which in one case lasted for 50 seconds. A 0.01 percent solution also caused irregularities and increased frequence of the heart beats. A 0.001 percent solution, however, had as a whole no effect upon the frequence of heart beats and irregularities only showed up later in the course of experimentation. The pulsation was weak and showed imperfect systoles and diastolic pauses. A 0.0001 percent solution had a paralyzing effect and the pulsation was weak and the systole imperfect.

VOGT, E. (2151)

1926. DIE CHEMISCHEN PFLANZENSCHUTZMITTEL IHRE ANWENDUNG UND WIRKUNG. 134 pp., illus. Berlin.

Nicotine and its insecticidal uses are briefly discussed (pp. 85-90). As a contact and fumigating poison nicotine paralyzes the nerve centers. Nicotine oleate, nicotine-copper-calcium, and other combinations are briefly described.

NELSON, F. C. (2152)

1927. THE PENETRATION OF CONTACT OIL SPRAY INTO THE BREATHING SYSTEM OF AN INSECT. Jour. Econ. Ent. 20: 632-635. [Abstract in Rev. Appl. Ent. (A) 16: 85-86. 1928.]

Flit and kerosene penetrate the tracheal tubes of bees and flies to a greater extent than previous work with nicotine sulphate would indicate.

WALKER, H. W., and MILLS, J. E. (2153)

1927. CHEMICAL WARFARE SERVICE, BOLL WEEVIL INVESTIGATION. Indus. and Engin. Chem. 19: 703-711.

Cotton boll weevils seemed to stand concentrations of gases entirely out of line with the known poisonous effect of the gas used. Weevils were found to survive after about 17 hours' exposure in pure carbon dioxide and hydrogen, and 4 out of 7 weevils recovered after 17 hours' submersion in water. Thus, weevils can live for some time without breathing oxygen.

The toxic dosage of nicotine per weevil was 0.00075 mg. at a concentration of 5 mg. per liter. The dosage was estimated from the toxic concentrations and times of exposure given, using the value 0.33 cc. as the amount of air breathed by a boll weevil in one hour (p. 709).

HEADLEE, T. J. (2154)

1928. THE INTELLIGENT USE OF PYRETHRUM AND NICOTINE SPRAYS AND DUSTS AGAINST VEGETABLE INSECTS. N. J. State Hort. Soc. Proc., pp. 54-57.

Penetration of nicotine spray solutions in the past by use of ordinary soap has been limited. The surface tension of water solutions must be reduced and the so-called interfacial tension existing between the water solution and the integument of the insect must likewise be reduced. The surface tension of distilled water at a certain temperature is between 76 and 77 dynes and that of kerosene ranges from 28 to 33 dynes. Sodium oleate, when mixed properly with water, reduced the surface tension of water to between 28.5 and 30 dynes. Kerosene readily enters the breathing pores of insects, and it was anticipated that a mixture of water, sodium oleate, and nicotine would do likewise, when the surface tension was sufficiently reduced. However, it was found necessary to form a film over the entire insect in order to penetrate the pores because of the waxy coating on the insect. In using nicotine sprays many insects may be killed by gas evolution that are not wet by the spray.

WILSON, G. F. (2155)

1928. NICOTINE AS AN INSECTICIDE. Amer. Jour. Pharm. 100 (6): 403-408.

This is reprinted from Chemist and Druggist. It is a brief review but no references are cited.

The action of nicotine on insects is to cause a complete paralysis of the motor centers brought about by a condensation of the vapor upon the walls of the tracheae, and subsequent absorption of the nitrogen atom by the nitrogen fat compounds that make up the nerve tissue, with the result that further absorption of oxygen is stopped and the insect is killed. Until recently, it was thought that nicotine solutions passed into the tracheae and penetrated into the integuments of insects, but it is now known that it is only the fumes from fumigants and the vapors from evaporated spray solutions and odoriferous particles from dusts which pass into the tracheae and are widely distributed to all the tissues. Nicotine is far less certain in its action when used as a stomach poison against biting insects, on which it acts mainly as a repellent (p. 403).

McGOVRAN, E. R. (2156)

1929. INCREASING THE EFFECTIVENESS OF THE NICOTINE INSECTICIDAL UNIT CHARGE. Jour. N. Y. Ent. Soc. 37 (4): 513-531. [Abstract in Rev. Appl. Ent. (A) 18: 278. 1930.]

Distilled water or distilled water carrying nicotine extract, having a surface tension of 40 or more dynes per cm. did not penetrate into the tracheae of the honey bee, even though the integument was thoroughly wetted. Addition of from 0.2 to 2 percent sodium oleate so reduced the interfacial and surface tensions as to permit this to occur. Sodium oleate soap was more effective than fish-oil soap. Free nicotine was more effective than nicotine sulphate against the cabbage aphid (*Brevicoryne brassicae* L.) when used with soap. Soap greatly reduced the lethal concentration of nicotine to the green apple aphid (*Aphis pomi* DeG.) When sodium oleate is used at a strength as great as 0.5 percent, the amount of nicotine necessary to kill aphids at summer temperature is very small.

STELLWAAG, F. (2157)

1929. ON THE ACTION OF NICOTINE. Anz. Schädlingsk. 5(3): 38-39. [In German. Abstract in Rev. Appl. Ent. (A) 17: 462. 1929.]

The pharmacological effect of nicotine insecticides on the larvae of the vine moths (*Clysia ambiguella* Hb. and *Polychrosis botrana* Schiff.) in Germany showed that the effect of the poison is typically a paralysis of the nerves. None of the various preparations acted as a corrosive poison. Most cases of poisoning occurred when the poison was taken by the mouth, pure nicotine sulphate being the most active constituent of the insecticides tested. The small doses used in viticulture, however, only gave poor results without a carrier, the best being a neutral or slightly alkaline soap, at the rate of 2 per thousand. Nicotine-soap acts rapidly through the mouth and quite as rapidly through the spiracles. A lime and copper sulphate mixture rapidly liberates the nicotine from nicotine sulphate, and therefore can produce the full effect of nicotine soft-soap only under favorable conditions. The practical conclusion is that tobacco extracts should contain as little free nicotine as possible, and that they should be used with the stated amount of soft soap.

HEADLEE, T. J. (2158)

1930. A MUCH CHEAPER TREATMENT FOR DESTROYING PLANT LICE. N. J. State Hort. Soc. Proc. Ann. Meeting 1929; 179-182. [Abstract in Biol. Abs. 5 (3): 859. Entry 8,559. 1931.]

Conditioning aqueous solutions of nicotine by addition of 0.5 percent sodium or potassium oleate soap resulted in destruction of common plant lice with a concentration of actual nicotine approximately 1/4 that necessary without this conditioning. The change leads to a reduction in the surface tension of aqueous solutions of nicotine and in the interfacial tension existing between these solutions and the integument of plant lice. It thus becomes possible to cover the insect's body quickly with a thin layer of an aqueous nicotine solution which secures entry to the breahing system, bringing the nicotine in direct contact with the internal tissues.

MOZNETTE, G. F. (2159)

1930. HOW SOME FACTORS LIMIT EFFORTS FOR ARTIFICIAL CONTROL OF THE PECAN NUT CASE-BEARER IN THE SOUTHEAST. Natl. Pecan Assoc. Bull. 4(1): 40-43, Mobile, Ala. [Abstract in Rev. Appl. Ent. (A) 19: 603. 1931.]

If the eggs of the above insect (Acrobasis caryae Grote) are coated with certain contact sprays, the embryo may be killed either by desiccation, by cutting off the supply of oxygen, or by physically preventing the emergence of the larva. Such sprays as nicotine or certain white oils, however, which kill the eggs when applied at definite strengths, are at present too expensive for general recommendation where many applications are necessary. The newly hatched larva is likely to die if made to crawl over clusters of small nuts recently coated with nicotine sulphate or pyrethrum extract.

O'KANE, W. C., WESTGATE, W. A., GLOVER, L. C., and LOWRY, P. R. (2160)

1930. SURFACE TENSION, SURFACE ACTIVITY, AND WETTING ABILITY AS FACTORS IN THE PERFORMANCE OF CONTACT INSECTICIDES. N. H. Agr. Expt. Sta. Tech. Bull. 39, 44 pp., illus.

Ionization, as of nicotine, may affect toxicity through alteration of surface activity and adsorption. Nicotine at successive concentrations exhibits evidence of the effects of increased molecular concentration at interfaces (pp. 2-3).

PORTIER, P. (2161)

1930. SYMPTOMS OF NICOTINE POISONING IN LEPIDOPTERA. Compt. Rend. Soc. Biol. 105 (30): 367-369. [In French. Abstract in Rev. Appl. Ent. (A) 19: 123. 1931.]

Experiments are described in which nicotine solution was applied to the tips of the antennae and wings of butterflies in order to study its effect on the nervous system. The action, which is convulsive, seems to be localized in the ganglia of the central nervous system, poison applied to the antennae affecting the cerebral ganglia first. The toxic action is proportionately greater as the temperature is higher.

RICHARDSON, C. H., and SHEPARD, H. H. (2162)

1930. THE EFFECT OF HYDROGEN-ION CONCENTRATION ON THE TOXICITY OF NICOTINE, PYRIDINE AND METHYLPYRROLIDINE TO MOSQUITO LARVAE. Jour. Agr. Res. 41 (4): 337-348, illus. [Abstract in Rev. Appl. Ent. (B) 19: 29-30. 1931.]

The speed of toxic action of these substances to the larvae of *Culex pipiens* L. was directly related to the concentration of the undissociated molecules. It is believed that the toxicity results largely from the penetration of the molecules into the body through the wall of the alimentary tract. Nicotine ions are somewhat toxic but much less so than nicotine molecules. Previous writers have explained the greater toxicity of nicotine over nicotine sulphate on the basis of the greater volatility of the former. In this study it was shown that the free base in solution is also much more toxic than nicotine sulphate.

STELLWAAG, F. (2163)

1930. TOXICITY AND TOXIC VALUE OF INSECTICIDES. PART III. THE GENERA TECHNIQUE OF DETERMINATION OF PHYSIOLOGICAL VALUE (CONCLUSION). Anz. Schädlingsk. 6 (6): 64-68, illus. [In German. Abstract in Rev. Appl. Ent. (A) 18: 525. 1930.]

It is pointed out that attention should be paid to external factors, such as temperature and light. Silkworms (*Bombyx mori* L.) died in 90 to 140 minutes at 53.6° F. and in 7 to 13 minutes at 89.6° F, when kept in glasses containing filter paper moistened with 0.0004 percent pure nicotine.

JANCKE, O. (2164)

1931. CONTRIBUTIONS TO THE CONTROL OF PESTS BY THE INTERNAL TREATMENT OF PLANTS. 1ST COMMUNICATION. Ztschr. Angew. Ent. 18 (2): 276-318, illus. [In German. Abstract in Rev. Appl. Ent. (A) 19: 725-726. 1931.]

Investigations with sucking and chewing insects have been made a Naumburg to test the value of nicotine and other substances as internal treatment of plants against insects. Doses tolerated by the plants were also tolerated by the insects, and a satisfactory effect on the latter almost always involved injury to the former. Nicotine, absorbed by grape-vine shoots and found in the leaf-tissue, did not penetrate the tissue of *Phylloxera* leaf-galls in 7 days, so that the aphids feeding in the galls were unaffected.

RAFFY, A., and PORTIER, P. (2165)

1931. INTENSITY OF THE RESPIRATORY EXCHANGES OF LEPIDOPTERA DURING FLIGHT. Compt. Rend. Soc. Biol. 108: 1062-1064. [In French. Abstract in Chem. Abs. 26: 1984. 1932.]

Several species of Lepidoptera were enclosed in tubes and their respiratory exchanges determined. During periods of convulsive beating of the wings induced by nicotine their oxygen consumption was 30-540 times as great as when at rest. Sphinx moths consumed 0.8 cc. oxygen per g. per hour at rest, 20 cc. when caused to beat their wings by shaking the tube, and 24 cc. during wing beating caused by nicotine. Longicorn beetles intoxicated by nicotine moved their feet rapidly as in walking and used eight times as much oxygen as when at rest.

SHEPARD, H. H., and RICHARDSON, C. H. (2166)

1931. A METHOD OF DETERMINING THE RELATIVE TOXICITY OF CONTACT INSECTICIDES, WITH ESPECIAL REFERENCE TO THE ACTION OF NICOTINE AGAINST APHIS RUMICIS. Jour. Econ. Ent. 24: 905-914, illus. [Abstract in Rev. Appl. Ent. (A) 19: 681. 1931.]

Nicotine and nicotine sulphate have been used against Aphis rumicis L. to develop a method that has been devised as a substitute for the usual spray tests in cases where greater precision is desirable, and to serve as standards of comparison of the toxicity of other compounds. The nicotine sulphate solutions were made by titrating nicotine base with 0.1 N sulphuric acid in the presence of methyl red, the end-point in this case being very close to pH 5.0. Groups of wingless adult females of A. rumicis were placed in medium-sized test tubes plugged with cotton and held in a constant temperature chamber at 26° C., to which the nicotine solutions were also brought. Each test-tube was then filled half full or more with the solution and the insects kept below the surface with a piece of cotton or cheesecloth. Aphids immersed according to this method in distilled water for an hour remain unaffected, and 60 percent recovered after immersion for 3 hours, so that actual drowning from immersion in insecticide solutions for up to 1 to 2 hours is somewhat slight. The nicotine base acts more rapidly than does the sulphate, and the results obtained in this study show a relation between the toxicity of the two in connection with aphids similar to that previously found in connection with mosquito larvae [(Rev. Appl. Ent. (B) 19: 29)].

CAMPBELL, F. L. (2167)

1932. PRELIMINARY EXPERIMENTS ON THE TOXICITY OF CERTAIN COAL-TAR DYES FOR THE SILKWORM. Jour. Econ. Ent. 25 (4): 905-917, illus. [Abstract in Rev. Appl. Ent. (A) 20: 641-642. 1932.]

The median lethal dose of nicotine by injection into fifth instar larvae of the silkworm (Bombyx mori L.) was about 0.0015 mg. per g.

HARTZELL, A., and WILCOXON, F. (2168)

1932. EXPERIMENTS ON THE MODE OF ACTION OF PYRETHRUM AND ITS EFFECTS O INSECT TISSUES. 5th Cong. Internatl. Ent. July. 289-293. [Abstract in Chem. Abs. 28: 5587. 1934.]

Nerve ganglia of insects killed by pyrethrum showed histological changes, but insects killed by decapitation, nicotine sulphate, or lead arsenate showed no histological changes.

HARTZELL, A., and WILCOXON, F. (2169)

1932. SOME FACTORS AFFECTING THE EFFICIENCY OF CONTACT INSECTICIDES. II. CHEMICAL AND TOXICOLOGICAL STUDIES OF PYRETHRUM. Contrib. Boyce Thompson Inst. 4 (1): 107-117, illus.

Nicotine (1 drop c.p.) put on the last abdominal segment of a tomato worm (*Phlegethontius quinquemaculata* Haw.) did not lead to death, but violent intoxication took place (p. 114).

HOCKENYOS, G., and LILLY, J. (2170)

1932. TOXICITY STUDIES OF HYPODERMIC INJECTION OF *CELERIO LINEATA* LARV Jour. Econ. Ent. 25 (2): 253-261, illus. [Abstract in Rev. Appl. Ent (A) 20: 417. 1932.]

The data secured indicate that for both organic and inorganic materials there often appears to be an optimum point of dilution at which they can be most efficiently used. Thus 0.0006 cc. of pure nicotine was injected in one case as 0.03 cc. of 2 percent dilution and in another case as 0.06 cc. of 1 percent dilution, the latter proving consistently more efficient than the former. Some possible reasons for this are suggested. The speed for paralyzation of a larva injected with nicotine sulphate of a given dilution was in direct proportion to the distance from the point of injection to the head. Thus larval muscle co-ordination is shown to be centered in the brain.

McGOVRAN, E. R. (2171)

1932. THE EFFECT OF SOME GASES ON THE TRACHEAL VENTILATION OF GRASSHOPPERS. Jour. Econ. Ent. 25 (2): 271-276. [Abstract in Rev. Appl. Ent. (A) 20: 418. 1932.]

Nicotine in certain concentrations, used as a gas, increased the volume of air inhaled into the tracheal system by the respiratory movements of a number of grasshoppers.

MISAKA, K. (2172)

1932. ON THE EFFECT OF NICOTINE SULPHATE ON THE EMBRYONAL DEVELOPMENT OF *CHILO SIMPLEX* BUTLER. Imp. Agr. Expt. Sta. Bull. 3 (3): 325-342, illus. [Tokyo] [Abstract in Rev. Appl. Ent. (A) 20: 433. 1932.]

Eggs in all stages of development were brushed with nicotine sulphate solutions of known strengths. A concentrations equivalent to 0.03 percent pure nicotine destroyed all eggs, whereas more dilute solutions killed the older ones only, the younger being merely retarded in development. It was found that the toxic action occurs when the fully developed nerves and tracheae begin to function, death being due to nicotine vapor inhaled through the egg shell. In another set of tests, eggs were placed in bottles in which pure nicotine was evaporated. A dose of 0.2836 mg. per l. killed all eggs except those less than 24 hours old. With smaller doses, all eggs survived.

RICHARDSON, C. H., and HAAS, L.E. (2173)

1932. THE RELATIVE TOXICITY OF PYRIDINE AND NICOTINE IN THE GASEOUS CONDITION TO TRIBOLIUM CONFUSUM DUVAL. Iowa State Coll. Jour. Sci. 6 (3): 287-298, illus. [Abstract in Rev. Appl. Ent. (A) 21: 421. 1933.]

Nicotine was on the average about 31 times as toxic as pyridine, causing 50 percent mortality in 360 minutes at a concentration of 0.228 mg. per l. and in 133 minutes at 0.42 mg., whereas the corresponding figures for pyridine were 8.8 and 12.9 mg.

YABUTA, T., and KOZU, T. (2174)

1932. TOXIC SUBSTANCE IN MULBERRY LEAVES DAMAGED BY TOBACCO. TOXIC ACTION OF NICOTINE AND TRIMETHYLAMINE ON SILK WORMS. Jour. Agr. Chem. Soc. Japan 8: 770-775. [Abstract in Chem. Abs. 27: 2220. 1933.]

The symptoms of poisoning by nicotine and trimethylamine in silk worms were compared. The toxic substance in damaged mulberry leaves seems to be nicotine.

O'KANE, W. C., WALKER, G. L., GUY, H. G., and SMITH, O. J. (2175)

1933. STUDIES OF CONTACT INSECTICIDES. VI. 1. REACTIONS OF CERTAIN INSECTS TO CONTROLLED APPLICATIONS OF VARIOUS CONCENTRATED CHEMICALS. 2. A NEW TECHNIQUE FOR INITIAL APPRAISAL OF PROPOSED CONTACT INSECTICIDES. N. H. Agr. Expt. Sta. Tech. Bull. 54, 23 pp., illus. [Abstract in Rev. Appl. Ent. (A) 22: 74-75. 1934.]

Tests were made of the sensitiveness of different parts of the larvae of Tenebrio molitor L. and cockroaches to minute drops of nicotine.

WILCOXON, F., and HARTZELL, A. (2176)

1933. SOME FACTORS AFFECTING THE EFFICIENCY OF CONTACT INSECTICIDES. III. FURTHER CHEMICAL AND TOXICOLOGICAL STUDIES OF PYRETHRUM. Contrib. Boyce Thompson Inst. 5 (1): 115-127, illus. [Abstract in Rev. Appl. Ent. (A) 21: 192-193. 1933.]

Observations carried out by means of a staining technique using toluidine blue revealed histological changes in the nerve ganglia killed by pyrethrum that did not occur in individuals killed by decapitation or by nicotine sulphate or lead arsenate.

CAMPBELL, F. L., SULLIVAN, W. N., SMITH, L. E., and HALLER, H. L. (2177)

1934. INSECTICIDAL TESTS OF SYNTHETIC ORGANIC COMPOUNDS -- CHIEFLY TES OF SULFUR COMPOUNDS AGAINST CULICINE MOSQUITO LARVAE. Jour. Econ. En 27: 1176-1185.

Of 68 synthetic organic compounds 24 were found to equal or exceed nicotine in effectiveness against mosquito larvae. Diphenylene oxide and diphenylene sulphide were the most effective of these compounds, killing nearly 100 percent of the larvae in 5 hours at 1 to 200,000.

LEVINE, N. D., and RICHARDSON, C. H. (2178)

1934. THE SYNERGISTIC EFFECT OF THE CHLORIDES AND BICARBONATES OF POTASSIUM AND SODIUM UPON THE PARALYTIC ACTION OF NICOTINE IN THE COCKROACH. Jour. Econ. Ent. 27: 1170-1175, illus.

Nicotine produced a distinctly greater paralytic activity in 0.1 M potassium chloride solution at lower concentrations of the alkalo than in solutions of any of the other salts used, effects being noticeable at nicotine concentrations of 0.0004, 0.0003, and 0.0002 percent. The American roach (Periplaneta americana L.) was used.

RICHARDSON, C. H., GLOVER, L. H., and ELLISON, L. O. (2179)

1934. PENETRATION OF GASEOUS PYRIDINE, PIPERIDINE AND NICOTINE INTO TH BODIES OF CERTAIN INSECTS. Science 80 (2064): 76-77.

In this preliminary report the insects were exposed to approxima maximum vapor concentrations of the compounds in air at 30° C., the exposure times being varied as desired. When entire insects were subject to the vapors, more nicotine in mg. per g. of tissue was found in the cuticula than in the entire insects.

To prove that these toxic gases do not necessarily first enter the body through the spiracles, pass from the tracheae to the blood, and then enter the cuticula from the blood, special tests were made with larvae of corn ear worms (Heliothis obsoleta Fab.), cockroaches (Periplaneta americana L.), and grasshoppers (Melanoplus femur-rubrum DeG.) by exposing parts of their legs, wings, and abdomens to the vapors for 120 minutes.

The results of these tests leave little doubt that these organic bases in gaseous condition passed directly through the cuticula of the insects.

Q. NICOTINE TANNATE AND OLEATE, 1918-1934

FILMER, R. S. (2180)

1931. COMPARATIVE PERFORMANCE OF NICOTINE TANNATE AND LEAD ARSENATE AGAINST THE CODLING MOTH. Jour. Econ. Ent. 24: 277-283. [Abstract in Rev. Appl. Ent. (A) 19: 358-359. 1931.]

Further experiments were carried out in New Jersey in 1930 with nicotine tannate [(Rev. Appl. Ent. (A) 18: 386]. As tests in 1929 showed rapid disappearance of the nicotine tannate from the fruit and foliage, spray applications were made at 10-day intervals in order to maintain a more constant coating of the material. Tests were made on early and late fruit from the seven-day spray onward with tank-mixed nicotine tannate (2 lb. tannic acid and 1 pt. 50-percent nicotine to 100 gal. spray material); and comparative tests with tank-mixed and powdered nicotine tannate (containing approximately 20 percent nicotine and applied at the rate of 2 lb. to 100 gal.) were made on late fruit against the second brood of the moth, following first brood treatment with lead arsenate. Both forms of nicotine tannate were applied with 2 pounds skim milk as spreader and 6 pounds colloidal sulphur as a fungicide. The results showed that nicotine tannate controls the codling moth (Carpocapsa pomonella L.) as well as lead arsenate, provided that a sufficient coating is maintained upon the foliage during the period of moth activity. There is need for further study to improve the adhesive qualities of nicotine tannate before it can be classed as an efficient arsenical substitute.

GINSBURG, J. M., and MANN, R. F. (2181)

1931. STUDIES WITH HYDRATED FERRIC OXIDE AS CORRECTIVE AND STICKER FOR LEAD ARSENATE AND NICOTINE TANNATE. Jour. Econ. Ent. 24: 695-701. [Abstract in Rev. Appl. Ent. (A) 19: 546. 1931.]

A product consisting of mixtures of ferric oxide and powdered skim milk was used as a spreader, sticker, and corrective with lead arsenate and nicotine tannate, and it was found that in the case of each of the insecticides, more remained on the foliage than when lime was used as a corrective.

HEADLEE, T. J. (2182)

1931(?) A FIVE-YEAR COOPERATIVE CAMPAIGN AGAINST THE CODLING MOTH. Peninsula Hort. Soc. [Del.] Trans. 1930, pp. 52-59. [Abstract in Rev. Appl. Ent. (A) 19: 270. 1931.]

Spraying experiments with a pyrethrum white oil and with nicotine tannate, which were tested as substitutes for sprays containing an arsenical, show that these insecticides are effective in control and by their use the necessity of washing the fruit is avoided.

ANONYMOUS (2183)

1932. REPORT OF THE DEPARTMENT OF ENTOMOLOGY. N. J. Agr. Expt. Sta. Rept. 1930-31, pp. 139-253, illus. [Abstract in Rev. Appl. Ent. (A) 20: 676-679. 1932.]

Tank-mixed nicotine tannate (cf. Rev. Appl. Ent. (A) 19: 385; 20: 515), with 3 lb. powdered sweet skim milk per 100 gal., was tested as a substitute for arsenicals against the codling moth. The control obtained was satisfactory but slightly inferior to that resulting from the use of lead arsenate sprays. Should it become possible to increase the retention of nicotine tannate on foliage and fruit, this substance will probably become the preferred substitute (p. 677). Dusts and sprays containing nicotine tannate gave some promise but could not be recommended as a substitute for magnesium arsenate against the Mexican bean beetle (Epilachna varivestis Muls.) (p. 678).

The application of a strong spray of soap and nicotine merely stupfied the weevils Diorymerellus laevimargo Champ. (p. 678). Young potted gardenia plants, treated with a spray containing 5 percent coconut fatty-acid soap and 0.25 percent free nicotine (40-percent) and dipped in the same material prior to setting out, remained comparatively free of the mealybug Pseudococcus citri Risso (p. 679).

CROWLEY, D. J. (2184)

1932. CRANBERRY BRANCH STATION. Wash. Coll. Agr. Expt. Sta. Bull. 275, pp. 64-67.

Excellent control was obtained against the fireworm with nicotine tannate at 1 to 500, when used at the rate of 1 to 400 against the cranberry fruitworm the number of injured berries was less than 0.5 percent. The season's work indicates that nicotine tannate is a more effective control for both the cranberry fireworm and the cranberry fruitworm than nicotine sulphate (p. 66).

ANONYMOUS (2185)

1933. INSECT PESTS IN NEW MEXICO IN 1931-32. N. Mex. Agr. Expt. Sta. 43d Ann. Rept. 1931-32, pp. 38-49, illus. [Abstract in Rev. Appl. Ent. (A) 21: 449-451. 1933.]

In codling moth studies, nicotine tannate showed promise of good control as a supplementary insecticide. It was the most successful of the insecticides tried against the onion thrips (Thrips tabaci Lind.) (p. 450). Some control of psyllids (Paratrioza cockerelli Sulc. and Empoasca abrupta DeLong.) was obtained with bordeaux - oil - nicotine sprays.

DRIGGERS, B. F. (2186)

1933. FRUIT INJURY ON APPLES FOLLOWING NICOTINE TANNATE SPRAYS. Jour. Econ. Ent. 26: 1137-1139.

A peculiar type of fruit injury following the use of nicotine tannate on apples was not duplicated when three varieties of apples were sprayed with nicotine tannate four times during July and August to control the codling moth. Observations indicate that the injury occurs when the fruit is young and relatively easily injured. Evidence points to the presence of tannic acid as being responsible for the injury and that an excess of free nicotine in the early cover sprays will reduce the amount of injury.

FARLEY, A. J. (2187)

1933. SOME EXPERIENCES WITH SPRAYING AND SPRAY RESIDUE REMOVAL IN NEW JERSEY. N. Y. State Hort. Soc. Proc. 78 (1933): 87-92. [Abstract in Rev. Appl. Ent. (A) 21: 317. 1933.]

Methods are described of washing fruit, and the use of a nicotine tannate spray (Rev. Appl. Ent. 19: 358) is suggested for certain varieties likely to be damaged in washing.

MACCREARY, D. (2188)

1933. THE EFFICIENCY OF CERTAIN PROPRIETARY OIL EMULSIONS, VOLCK AND ORTHOL-K, FOR THE CONTROL OF THE ORIENTAL FRUIT MOTH Del. Agr. Expt. Sta. Bull. 184, 43 pp., illus. [Abstract in Rev. Appl. Ent. (A) 22: 470-471. 1934.]

When thorough coverage is obtained in the laboratory, summer oil (above 1/2 percent) combined with nicotine tannate or nicotine sulphate kills practically all the eggs of the above moth. A combination of 2 percent summer oil, lime (decreasing from 32 to 4 lb. in successive applications) and 1 pt. nicotine sulphate to 100 gal. is apparently the most effective spray to reduce infestation of this insect on peach trees.

RICHARDSON, H. H., and NELSON, R. H. (2189)

1933. FIELD CONTROL OF THE GLADIOLUS THRIPS (TAENIOTHRIPS GLADIOLI M. & S.) Jour. Ent. 26 (3): 546-554. [Abstract in Rev. Appl. Ent. (A) 21: 466-467. 1933.]

A paris green and brown sugar spray was far more efficient than one consisting of 1/2 pt. nicotine solution (50-percent), 1 lb. tannic acid, and 1 lb. ferric oxide-skim milk in 50 gal. water. A spray consisting of 2 qt. pine-tar oil, 6 fl. oz. 40-percent nicotine sulphate and 8 gal. water, as well as a nicotine sulphate-soap spray, had a distinctly injurious effect on the gladiolus plants. A spray consisting of 12 fl oz. white oil, 1 fl.oz. nicotine sulphate and 8 gal. water was effective, but did not approach the paris green and brown sugar spray in efficiency.

RICHARDSON, C. H., and THURBER, G. A. (2190)

1933. FURTHER STUDIES ON THE RELATIVE TOXICITY OF POISONS FOR GRASSHOPPER BAITS. Jour. Econ. Ent. 26 (2): 494-499. [Abstract in Rev. Appl. Ent. (A) 21: 341-342. 1933.]

Nicotine tannate has a low but undetermined toxicity for adult grasshoppers (Melanoplus differentialis Thomas).

CHAPMAN, P. J. (2191)

1934. NEW DEVELOPMENTS IN APPLE PEST CONTROL IN THE HUDSON VALLEY. N. Y. State Hort. Soc. Proc. 79th Ann. Meeting 1934, pp. 201-206. [Abstract in Chem. Abs. 28: 3827. 1934.]

Nicotine tannate and nicotine sulphate with a fixator gave little or no control of the apple maggot. Nicotine sulphate added to the calyx or petal-fall sprays, gave efficient control of the apple redbug.

HEADLEE, T. J. (2192)

1934. TO WHAT EXTENT MAY ORGANIC INSECTICIDES BE USED AS SUBSTITUTES FOR ARSENICALS. Jour. Econ. Ent. 27: 148-156.

A natural step with tobacco extracts was to produce nicotine compounds in liquid, paste, and solid form. Nicotine oleate is a liquid paste, while nicotine tannate is a solid. Nicotine oleate has considerable toxicity against a number of different insects, but has not been developed extensively for the codling moth problem. Nicotine tannate, on the other hand, which is the result of a combination of free nicotine and tannic acid, has received a considerable amount of attention as a toxic agent for control of the codling moth. The author mentions the work by Headlee, Ginsburg, and Filmer done in by Filmer done in 1930; by Moore, done in 1931; by Headlee (work done 1932 by Thompson); by Driggers and Pepper done in 1933. Thus it appea from the results, chiefly obtained in New Jersey, that nicotine tannat is decidedly more effective than lead arsenate or lead arsenate-oil. A considerable portion of the data from the other parts of the country is not in agreement with the facts stated above.

Headlee offers an explanation of these differences. Nicotine tannate disappears from the foliage; about 75 percent of the nicotine disappears in 10 days; rainfall decidedly expedites this disappearance and strong alkalies destroy the efficiency of nicotine tannate. It seems that failures to obtain control with nicotine tannate are due to too frequent applications, rainfall wash-off, the use of excessively alkaline waters or the inclusion of strong alkali spray materials.

A way toward the reduction in cost of nicotine treatments was indicated by Drigger's work, in which he was able to maintain a toxic dose of nicotine on fruit and foliage through the combination of nicotine tannate and bentonite sulphur. Bentonite sulphur is a combinatio at the melting point, of sulphur and bentonite, the latter being clay. The adhesive properties of the resulting compound are entirely beyond the adhesion of the two components.

MOORE, WM. (2193)

1918. A PROMISING NEW CONTACT INSECTICIDE. Jour. Econ. Ent. 11: 341-342. [Abstract in Chem. Abs. 12: 2026. 1918.]

The preparation and uses of nicotine oleate are described. It can be made from any nicotine preparation containing free nicotine and commercial oleic acid or red oil. Two and one-half parts of a 40-percent solution of nicotine unite with 1 3/4 parts of commercial oleic acid. Nicotine oleate solution containing 1 part of nicotine in 100 parts of water did not injure tomatoes or coleus, but caused slight injury to tender leaves of greenhouse roses. The stearate and palmitate are not so effective.

RUGGLES, A. G. (2194)

1918. SPRAYING. Minn. Univ. Farm Circ. 48, 16 pp., illus. [Abstract in Rev. Appl. Ent. (A) 6: 370. 1918.]

Nicotine oleate is a combination of a free nicotine extract, such as Nicofume, with commercial oleic acid, often called red oil. Two and one-half parts of 40-percent free nicotine solution thoroughly mixed with 1 3/4 parts of red oil will unite to form this material. A 50 gal. spray can be made by diluting 1/3 pt. of nicotine oleate. It is important that soft water, either rain or distilled, should be used for this spray. While nicotine oleate alone is more effective than the nicotine extracts now on the market, it can be made still more so by emulsifying an oil with it. For mealybug (Pseudococcus) and whitefly (Aleurodes)the solution described should be diluted with soft water to make 500 parts.

BRITTON, W. E., and ZAPPE, M. P. (2195)

1919. TESTS OF SPRAYS TO CONTROL THE POTATO APHID. Conn. State Ent. 18th Rept., 1918. Conn. Agr. Expt. Sta. Bull. 211, pp. 294-297. [Abstract in Rev. Appl. Ent. (A) 7: 342. 1919.]

Black Leaf 40 with sufficient soap to cause suds killed a large percentage of aphids. Nicotine plus lime-sulphur, and nicotine with molasses were tried with very little success. Four oz. of casein-lime (casein 30 percent, quick lime 70 percent) per 50 gal. of nicotine-lead arsenate spray was of questionable value as a spreader and did not enhance the killing value of the nicotine. Nicotine oleate alone or with soap bark or with glycerine did not seem any more effective than Black Leaf 40 and soap.

DIETZ, H. F., and ZETEK, J. (2196)

1920. THE BLACK FLY OF CITRUS AND OTHER SUBTROPICAL PLANTS. U. S. Dept. Agr. Bull. 885, 55 pp., illus. [Abstract in Rev. Appl. Ent. (A) 9: 306-307. 1921.]

Preliminary work during the rainy season has shown that nicotine oleate prepared according to Moore's formula (Rev. Appl. Ent. (A) 6: 422) gives good results against Aleurocanthus woglumi Ashby in the Panama Canal Zone.

DAVIS, J. J. (2197)

1922. INSECT PROBLEMS IN INDIANA DURING 1921. Jour. Econ. Ent. 15: 277-282. [Abstract in Rev. Appl. Ent. (A) 10: 530-531. 1922.]

Nicotine sulphate (1 oz. to 5 gal. water containing 1 lb. fish-oil soap) seems preferable to nicotine oleate at the rate of 1 oz. to gal. for the control of immature of such scales as the cottony maple scale, (*Pulvinaria vitis*), oyster-shell scale, (*Lepidosaphes ulmi*), and the San Jose scale, (*Aspidiotus perniciosus*).

WALLACE, F. N., et al. (2198)

1922. REPORT OF THE DIVISION OF ENTOMOLOGY. Ind. Dept. Conserv. 3d A Rept. 1920-21, pp. 37-57. [Abstract in Rev. Appl. Ent. (A) 10: 311- 1922.]

Against the whitefly (*Aleurodes*) nicotine oleate has been used successfully. It is prepared by mixing 1 3/4 pt. of commercial or technical oleic acid or "red oil" with 2 1/2 pt. of nicofume liquid, 1 fl oz. of this mixture being used to 2 gal. of soft water. Spraying with 1 part Black Leaf 40 to 500 parts water, with 1 oz. fish-oil soap to each gal. water, or with 1 fl. oz. nicotine oleate to 2 gal. w is effective against the chrysanthemum midge (*Diarthronomyia hypogaea*) Nicotine oleate will also control mealybugs (*Pseudococcus*) and greenho orthezia (*Orthezia insignis*). Remedial measures recommended for the r midge (*Neocerata rhodophaga*) include nightly fumigation with nicotine papers or tobacco stems for two to three weeks, keeping the benches covered with 1/4 to 1/2 in. tobacco dust, which must be renewed as it comes wet. Nicotine oleate and tobacco dust have given fair results against the cyclamen mite (*Tarsonemus pallidus*).

HARTZELL, A., and LATHROP, F. H. (2199)

1925. AN INVESTIGATION OF SULPHUR AS AN INSECTICIDE. Jour. Econ. Ent. 267-279, illus. [Abstract in Rev. Appl. Ent. (A) 13: 332-333. 1925

To test the effect of adding a small amount of nicotine oleate, 12 cc. of oleic acid and 20 cc. of nicotine were dissolved in 200 cc. water and then combined with 100 cc. of the stock solution. At a dilution of 1 to 40 the combined emulsion killed 97 percent of *Psylla pyri* and no foliage injury was caused to the pear trees sprayed.

SNYDER, T. E. (2200)

1926. PREVENTING DAMAGE BY TERMITES OR WHITE ANTS. U. S. Dept. Agr. Farmers' Bull. 1472, 22pp., illus. [Abstract in Rev. Appl. Ent. (A 14: 409-410. 1926.]

Kerosene nicotine oleate or 5 percent kerosene emulsion sprayed greenhouse staging, or, at night, on potted plants, effectively contro termites.

WALLACE, F. N., et al. (2301)

1926. REPORT OF THE DIVISION OF ENTOMOLOGY. Ind. Dept. Conserv. 7th Ann. Rept., 1925, 31 pp. [Abstract in Rev. Appl. Ent. (A) 15: 186-187. 1927.]

The coccids (Pseudococcus citri Risso and P. adonidum L.) on greenhouse plants were controlled by spraying with nicotine oleate. Beetles (Epicauta pennsylvanica DeG.), which attacked aster flowers, can be controlled by nicotine oleate at the rate of 1 oz. to 1 gal. water

SMITH, F. F. (2302)

1927. PSEUDOCOCCUS MARITIMUS, EHRHORN, A PEST OF GLADIOLUS AND CALLA. Jour. Econ. Ent. 20: 843-844. [Abstract in Rev. Appl. Ent. (A) 16: 269. 1928.]

Nicotine oleate was used, but the results are not conclusive as the plants had been so badly infested that they all died soon after planting.

R. OIL EMULSIONS AND MISCIBLE OILS COMBINED WITH NICOTINE, 1915-1934

NEWCOMER, E. J. (2203)

1918. SOME STONEFLIES INJURIOUS TO VEGETATION. Jour. Agr. Res. 13: 37-41, illus. [Abstract in Rev. Appl. Ent. (A) 6: 388-389. 1918.]

Crude oil emulsion plus nicotine sulphate and nicotine sulphate plus soap gave some measure of relief against Taeniopteryx.

P., T. (2204)

1923. NICOTINE PETROLEUM EMULSION, A COMBINED INSECTICIDE. Bur. Bio-Tech. [Leeds] Bull. 9 (vol. 2): 27-31.

This spray has had an extensive use among commercial growers for controlling aphids, capsid bugs, apple and pear suckers, young scale insects, red spiders on cucumbers and tomatoes, and woolly aphids on various plants.

This emulsion is in reality a colloidal solution, and the particle can be seen only with the aid of an ultra microscope. In the nicotine petroleum emulsion we have a compound which embraces the various classes of insecticides, and on this account, and in view of its colloidal state, it should find extensive use among commercial growers generally.

FRENCH, C., JR., and PILLOUD, L. (2205)

1924. CONTROL OF WOOLLY APHIS. Jour. Dept. Agr. Victoria 22 (12): 725-727, illus. [Abstract in Rev. Appl. Ent. (A) 13: 117. 1925.]

Eriosoma lanigerum Hausm. the woolly aphid, may be satisfactori controlled by a spray made as follows: 1 lb. soap is boiled in 1 gal. water until dissolved, to this 1 gal. of red oil is added and when thoroughly mixed also 1 pt. nicotine sulphate. When the whole is well mixed 80 gal. water are added and, if the water is hard, a small piece washing soda.

HOYT, L. F. (2206)

1924. NICOTINE SOAPS. Indus. and Engin. Chem. 16: 1171-1172. [Abstr in Chem. Abs. 19: 697. 1925.]

Coconut-oil nicotine soap was superior to nicotine soap made with oleic acid and castor oil in lathering power and spreading power. At 1 to 500 in soft water both the coconut oil and oleate products proved very effective against green apple aphid, woolly aphid and cabbage aphid.

SIEGLER, E. H., and POPENOE, C. H. (2207)

1924. SOME INSECTICIDAL PROPERTIES OF THE FATTY ACID SERIES. Jour. Agr. Res. 29: 259-261. [Abstract in Chem. Abs. 19: 1174., 1925.]

Fatty acids from coconut oil compared favorably with a commerci nicotine preparation in killing the black chrysanthemum aphid.

ALLEN, W. J., and BRERETON, W. LeG. (2208)

1925. ORCHARD NOTES. Agr. Gaz. N. S. Wales 36 (7): 525-531.

Last year the Victorian Department of Agriculture tested and found the following spray very effective for the woolly aphid: 1 gal. red oil, 1 pt. 40-per cent nicotine sulphate, 2 lb. soap, and 80 gal. water. Both 40-percent nicotine sulphate and tobacco wash combined with lime-sulphur 10 years ago kept trees clear of woolly aphids longer than did either one alone, but a recent test did not confirm this. Another woolly-aphid spray consists of 1 lb. caustic soda, 3/4 pt. 40-percent nicotine sulphate, and 100 gal. water and is to be applied before the trees start in the spring (pp. 530-531).

ROSS, W. A. (2209)

1925. LUBRICATING OIL SPRAYS WITH SPECIAL REFERENCE TO THEIR USE ON P PSYLLA. Fruit Growers' Assoc. Ontario, 57th Ann. Rept., pp. 77-81. [Abstract in Rev. Appl. Ent. (A) 15: 68. 1927.]

Spraying for the control of the pear psylla (Psylla pyricola Först.) is done more economically with 3 percent lubricating oil spray than with lime-sulphur or nicotine sulphate.

MAKGILL, R. H. (2210)

1926. DETERRENT SPRAYS FOR PEAR-MIDGE. Jour. Dept. Agr. New. Zeal. 3 311-315.

In 1925 the following spray mixture was tried as a deterrent against the pear midge (*Perrisia pyri* Bch.) in New Zealand: Black Leaf 40 (1:800) and 2 percent mineral oil (sold as Olene). A certain amount of leaf scorch was produced, consequently oil was not used again.

The following spray mixture was applied to a block of 18 three-year-old trees: Black Leaf 40 (1:800), solution of glue, 1/2 lb. soap, and 100 gal. water. This spray was an effective deterrent of midge-infestation during October and November.

JACOBSEN, W. C. (2211)

1927. REPORT FOR 1926 OF THE BUREAU OF PLANT QUARANTINE AND PEST CONTROL Calif. Dept. Agr. Monthly Bull. 15 (7-12): 113-142. [Abstract in Rev. Appl. Ent. (A) 16: 193-195. 1928.]

Preliminary field tests with nicotine sulphate and refined oil emulsions gave very satisfactory control of *Drepanothrips reuteri* Uzel attacking grape.

DE ONG, E. R. (2212)

1928. PETROLEUM OIL AS A CARRIER FOR INSECTICIDES AND AS A PLANT STIMULANT. Indus. and Engin. Chem. 20: 826-827. [Abstract in Rev. Appl. Ent. (A) 17: 512-513. 1929.]

Nicotine is miscible in certain kerosenes up to 12 percent and the rate of volatility from light oils is similar to that from water. Kerosene alone used as a 2 percent emulsion killed 79.5 percent of brown apricot scales (*Lecanium corni* Bch.); kerosene plus 0.01 percent free nicotine killed 92.4 percent. Oils can be used for their physical rather than their insecticidal properties.

------- (2213)

1928. PETROLEUM OIL AS A CARRIER FOR NICOTINE. Jour. Econ. Ent. 21: 502-504. [Abstract in Chem. Abs. 22: 4197. 1928.]

Oil + .01 and .02 percent nicotine was more effective against the brown apricot scab (*Lecanium corni*) than oil alone. Kerosene and three highly refined petroleum oils were tested as insecticides with and without the addition of nicotine (0.01 and 0.02 percent) for the brown apricot scale (*Lecanium corni*). The oil-nicotine mixtures were more effective than the oils alone. It was also found that kerosene-nicotine was nearly as efficient as the heavier oils mixed with nicotine with advantages to the former, in favor of cost and danger to plant tissues. Oil-nicotine mixtures are promising for use on trees in foliage. They probably will not offer advantages over other oil preparations for dormant spraying.

------- (2214)

1928. PROGRESS REPORT ON THE USE OF PETROLEUM OIL AS AN INSECTICIDAL SPRAY. Jour. Econ. Ent. 21 (4): 525-529. [Abstract in Rev. Appl. Ent. (A) 16: 671. 1928.]

The incorporation of nicotine or other active insecticides directly into the oil before emulsifying offers the possibility of increasing the toxicity of the oil itself without increasing the danger to the plant.

------- (2215)

1928. SPECIFICATIONS FOR PETROLEUM OILS TO BE USED ON PLANTS. Jour. Econ. Ent. 21: 697-702. [Abstract in Rev. Appl. Ent. (A) 17: 75. 19

Lower insecticidal value resulting from the use of highly refined oils may be compensated for in part by incorporating other and more active chemicals such as nicotine. Specially refined pine oils may also be found useful as solvents for nicotine blends with petroleu oils, particularly for use on citrus.

------- (2216)

1929. THE CHARACTERISTICS AND USES OF PETROLEUM OIL SPRAYS. Trans. 4 Internatl. Cong. Ent. 1928, 2: 145-154, illus.

It was found in a number of instances that the oil-nicotine com binations interfered less with the functioning of the leaf than did the same oil used alone. In all these combinations an uncombined (95-percent) nicotine was used. A distinct advantage in the oil-nicotine combinations was that of the uniformly high toxicity obtained against the brown apricot scale (Lecanium corni Bch.) (pp. 146- 147).

HARMAN, S. W. (2217)

1930. THE EFFICIENCY OF VARIOUS INSECTICIDES IN CONTROLLING THE BUD M Jour.Econ. Ent. 23: 184-187. [Abstract in Rev. Appl. Ent. (A) 18: 402-403. 1930.]

In orchards heavily infested with Eucosma (Spilonota) ocellana Schiff., nicotine was the only material to which the overwintering larvae were susceptible. In such cases twice the usual dose of 1 pt. 40-percent nicotine sulphate was required. When used with linseed oil or fish oil (1 qt.in 100 gal.) or with lubricating oil emulsions the effectiveness of the nicotine was apparently increased. Lead arsenate which was apparently of little value early in the season was effective in midsummer when used at the rate of 3 lb. to 100 gal. either alone c with the addition of 1 pt. nicotine sulphate during the egg-hatching p

HEADLEE, T. J. (2218)

1930. REPORT OF THE DEPARTMENT OF ENTOMOLOGY. N. J. Agr. Expt. Sta. Rept. 1928-1929, pp. 125-207, illus. [Abstract in Rev. Appl. Ent. (19: 168. 1931.]

In tests designed to reduce the high cost of controlling aphids (Aphis pomi DeG.) by increasing the efficiency of nicotine extract, very satisfactory results were obtained with a spray of 1/3 pt. 40-percent free nicotine and 6 lb. potassium oleate soap (40 percent water), to 100 gal. water. Several applications may be necessary to prevent the leaves from being curled. Painting the entrances to the burrows of the larvae of Zeuzera pyrina L. was effective when nicotine was added to the pine-tar oil.

PARROTT, P. J., and GLASGOW, H. (2219)

1930. THE ROSY APHID IN RELATION TO SPRAY PRACTICES. Jour. Econ. Ent. 23: 182-184. [Abstract in Rev. Appl. Ent. (A) 18: 401-402. 1930.]

Best control (injured apples 0.28 to 3.06 percent) of rosy aphid (Anuraphis roseus Baker) on apple was obtained with lime sulphur (1:40) plus 1 pt. nicotine sulphate per 100 gal. Insecticidal efficiency varied with the nicotine content; 1/2 pt. nicotine sulphate per 100 gal. gave 7.38 percent infested apples and 1/4 pt. gave 12.46 percent. Nicotine sulphate in 3 percent oil emulsion containing gum arabic as the emulsifier gave 7.02 percent infested fruit and free nicotine in oil, 6.21 percent.

Nicotine sulphate in lime-sulphur proved consistently more effective than bordeaux mixture containing the same amount of nicotine sulphate. Nicotine sulphate added to oils enhances their action on aphids.

DENNYS, A. A. (2220)

1933. MATERIALS USED AS CANKER PAINTS IN WOOLLY APHIS CONTROL. Ent. Soc. Brit. Columbia Proc., No. 30, pp. 8-10. [Abstract in Rev. Appl. Ent. (A) 22: 108. 1934.]

For painting cankers and pruning wounds on apple trees to prevent infestation of Eriosoma lanigerum Ham. (cf. Rev. Appl. Ent. (A) 19: 104), the best material was a mixture of 25 percent of a special machine oil and 2.5 percent nicotine sulphate emulsified in water with 5 percent wheat flour (boiled into a paste). Tests using the constituents separately showed that the nicotine sulphate produced the toxic effect. The author suggests that it forms an oil-soluble aluminium-nicotine-naphthenate compound with the oil so that the duration of its toxicity is prolonged.

JONES, P. R. (2221)

1915. PRELIMINARY REPORT ON SPRAYING OF EGGS FOR THE CONTROL OF THE PURPLE AND GREEN APPLE APHIDS OF CALIFORNIA. Calif. Hort. Comn. Monthly Bull. 4 (1): 20-30.

Against aphid eggs, Black Leaf 40 (1:1000) was used in combination with lime-sulphur, home-made distillate oil emulsion, commercial miscible oil, commercial distillate oil emulsion, "Yel-Ros", commercial crude oil emulsion, liquid whale-oil soap, and asphalt emulsion. In nearly every test no aphids (*Aphis pomi* and *A. sorbi*) appeared on the sprayed leaves.

PARROTT, P. J. (2222)

1921. THE SEASON'S EXPERIENCE WITH INSECTS AND INSECTICIDES. N. Y. Sta Hort. Soc. Proc. 66th Ann. Meeting, pp. 17-37. [Abstract in Rev. App Ent. (A) 10: 210. 1922.]

Leafhopper nymphs on apples, especially in the earlier stages are very susceptible to nicotine. Timely and thorough spraying with miscible oil and nicotine sulphate is the most promising remedial measure against pear thrips (*Taeniothrips inconsequens* Uzel.). Applica tions of lime-sulphur and nicotine sulphate afford a certain amount of protection against the rosy aphid (*Aphis sorbi* Kalt.).

PRIMM, J. K., and HARTLEY, E. A. (2223)

1923. RESULTS OF AN OIL SPRAY IN TREATMENT OF BOX LEAF MINER (*MONARTHR* *PALPUS BUXI* LABOU). Jour. Econ. Ent. 16: 435-440. [Abstract in Rev. Appl. Ent. (A) 11: 583-584. 1923.]

One or two applications of an oil (Bé. 16-17, viscosity 1,200 at 70° F.) at 1 to 20 plus nicotine sulphate (40-percent) at 1 to 400 made shortly before the beginning of emergence will greatly reduce infestation by this cecidomyiid. A second application should follow in about a week.

HAMILTON, C. C. (2224)

1925. THE BOXWOOD LEAF MINER *MONARTHROPALPUS BUXI* LABOU. Md. Agr. Exp Sta. Bull. 272, pp. 143-170, illus. [Abstract in Rev. Appl. Ent. (A) 14: 65. 1926.]

The best control for *M. buxi* is spraying with molasses, 1 part to 4 parts water plus nicotine sulphate (40-percent) 1 to 500. The oil and nicotine sulphate spray recommended by Primm and Hartley [Rev. Appl Ent. (A) 11: 583] was tested and gave fairly good control but caused considerable scorching. Molasses and tobacco dust was not so effective Free nicotine was found in laboratory tests to be less satisfactory tha nicotine sulphate.

MAKGILL, R. H. (2225)

1925. THE PEAR-MIDGE PEST. SPRAYING EXPERIMENTS AT HENDERSON. New Zea Jour. Agr. 30 (4): 224-228. [Abstract in Rev. Appl. Ent. (A) 13: 404-405. 1925.]

Tests were made with the nicotine-paraffin spray [Rev. Appl. Ent. (A) 8: 349] against the pear-midge (Perrisia pyri Bch.). A 2 - percent miscible oil spray and 40-percent nicotine sulphate were used in place of the original formula. The modified mixture acted well against the woolly aphid (Eriosoma lanigerum Hausm.). The addition of nicotine sulphate to the oil emulsion before instead of after dilution threw a certain amount of the oil out of suspension resulting in scorching the leaves. On some trees a mixture of 6 lb. molasses in 100 gal. water containing 1 to 1000 nicotine sulphate was used. During October spraying at intervals of 3 weeks appeared to keep P. pyri in check but during November weekly spraying was apparently inadequate.

JACOBSEN, W. C. (2226)

1928. REPORT FOR 1927 OF THE BUREAU OF PLANT QUARANTINE AND PEST CONTROL. Calif. Dept. Agr. Monthly Bull. 16 (12): 633-677. [Abstract in Rev. Appl. Ent. (A) 17: 63-65. 1929.]

The most effective insecticide against bean thrips (Heliothrips fasciatus Perg.) was a combination of a light miscible oil with nicotine sulphate.

McDANIEL, E. I. (2227)

1928. TWO SPRUCE CHERMES INFEST MICHIGAN SPRUCE. Mich. Agr. Expt. Sta. Quart. Bull. 10 (3): 128-131, illus. [Abstract in Rev. Appl. Ent. (A) 16: 524. 1928.]

Trees infested with Chermes abietis L. (spruce gall aphid) and C. similis Gill should be sprayed in the spring before the new growth starts with miscible oils 1 to 20, 2-percent oil emulsion, or nicotine sulphate (40-percent) at 1 to 800, plus 4 lb. soap to 100 gal.

REGAN, W. S. (2228)

1928. OIL SPRAYS AND THEIR RELATION TO ORCHARD PEST CONTROL. Wash. State Hort. Assoc. Proc. 23 (1927): 64-71. [Abstract in Rev. Appl. Ent. (A) 17: 224-225. 1929.]

Best results against aphids (Aphis pomi DeG. and Anuraphis roseus Baker) in curled leaves can be obtained by the use of nicotine or a nicotine-oil spray combination; the latter is also of value in the control of the woolly aphid (Eriosoma lanigerum Hausm.).

WOODHILL, A. R. (2229)

1928. SPRAYING FOR WOOLLY APHIS. THE ADDITION OF MISCIBLE OIL TO SUMMER TOBACCO SPRAYS. Agr. Gaz. New S. Wales 39 (8): 613-614. [Abstract in Rev. Appl. Ent. (A) 16: 685. 1928.]

No advantage is gained by adding small quantities of miscible oil to sprays of tobacco and nicotine sulphate against the woolly aphid (Eriosoma lanigerum Hausm.), while if more than 2 pt. per 100 gal. is added, scorching of the apple foliage may result.

HOERNER, J. L. (2230)

1929. A PROGRESS REPORT ON THE TESTING OF SULPHONATED OXIDATION PRODUCTS OF PETROLEUM FOR THEIR INSECTICIDAL PROPERTIES. Md. Agr. Expt. Sta. Bull. 310, pp. 449-465. [Abstract in Rev. Appl. Ent. (A) 17: 715-716. 1929.]

Records tests with different commercial forms of nicotine in combination with Penetrol and sulphonated oxidized gas oil against 29 spec of aphids. Penetrol increases the efficiency of nicotine.

INMAN, M. T., JR. (2231)

1929. SULPHONATED OXIDATION PRODUCTS OF PETROLEUM AS INSECTICIDE ACTIV TORS. Indus. and Engin. Chem. 21 (6): 542-543. [Abstract in Biol. A 6 (5): 1429. Entry 13,927. 1932.]

Addition of certain oxidation products of petroleum to nicotine sulphate sprays for soft-bodied insects greatly increases their insecticidal efficiency; added at the rate of 1 to 200, a satisfactory ki may be obtained with 1/3 - 1/5 of the nicotine otherwise necessary. Such oxidation products of petroleum are regarded as activators, and ar supposed to function by: (1) Promoting wetting of the leaf and of the insect; (2) carrying the insecticide; (3) penetrating to the vital orga of the insect; (4) toxicity of their own.

SMITH, R. H. (2232)

1929. EXPERIMENTS WITH TOXIC SUBSTANCES IN SPRAY OILS IN CONTROLLING R SCALE. Calif. Citrograph 14 (8): 315 and 326. [Abstract in Rev. Appl Ent. (A) 17: 511-512. 1929.]

Attempts to increase the efficiency of light oils against the red scale (Chrysomphalus aurantii Mask.) by the addition of various toxic substances are described.

The purest form of nicotine available (95 percent) is very soluble in water, but only slightly so in spray oils. Of the many substances tried, a few, including butanol (normal butyl alcohol), isopropyl alcohol, oleic acid and pine oil, were found to act as intermediate solvents between nicotine and oil. One part of nicotine dissolved in 5 parts of butanol is completely soluble in 50-70 parts of oil. When the oil thus impregnated is mixed with water, however, the nicotine gradually passes into the latter. A highly refined kerosene oil with a viscosity of 30 seconds was used in nearly all of the tests, because when used alone it had but slight effect on the red scale. The impregnated oil was added to the water, and the mixture was immediately applied to fruit in the laboratory while being vigorously shaken. In the case of nicotine, it was thought that by this method at least 25 percent of it remained in the oil. The results, some of which are tabulated and discussed, were decidedly disappointing, and no combination of poisons showed any practical value. The possible ways in which red scale is killed by oil sprays are discussed.

CUTRIGHT, C. R. (2233)

1930. APPLE APHIDS IN OHIO. Ohio Agr. Expt. Sta. Bull. 464, 59pp., illus. [Abstract in Rev. Appl. Ent. (A) 19: 202-203. 1931.]

The spray tests deal with Aphis pomi DeG., Anuraphis roseus Bak. and Rhopalosiphum prunifoliae Fitch. Lime-sulphur to which nicotine sulphate had been added, gave the best results against the eggs. The addition of nicotine to oil sprays did not give an increased efficiency sufficient to justify the extra cost. In laboratory tests against young stem mothers, sprays in which oils (2 percent) were used as spreaders or as liberators of nicotine sulphate gave the best results. Of a number of derris products, only derrisol at 1 to 800 gave satisfactory results, and nicotine sulphate was equally effective at a lower concentration and cost. Field tests showed that the addition of nicotine sulphate in proportions of from 1 to 400 and 1 to 800 to the late dormant lime-sulphur sprays considerably increased their effect. The strength of the nicotine is of greater importance in control than is that of the lime-sulphur.

In laboratory tests with summer sprays against Aphis pomi, nicotine sulphate at 1 to 1,600, combined with 0.75 percent miscible oil or 1 percent oil emulsion, gave the best results. In field tests 1 percent Volck oil was most effective with nicotine sulphate at 1 to 1,600. No injury to the foliage occurred and a mortality of 99.5 percent was obtained. Penetrol, used in laboratory tests at 1-percent strength combined with nicotine (1:2,000) gave 100 percent mortality.

HARTZELL, F. Z. (2234)

1930. TOXICITY OF SPRAYS AND SPRAY INGREDIENTS ON PEAR PSYLLA NYMPHS. Jour. Econ. Ent. 23: 190-197. [Abstract in Chem. Abs. 24: 3311. 1930.]

The toxicity of nicotine solutions to nymphs of Psylla pyri reached a maximum at a dilution of 1 to 3,200. The nicotine content of sprays may be considerably reduced if other toxic substances, which do not react unfavorably with the nicotine are added. These substances are: Penetrol, white petroleum oils, pine oil, and a commercial neutral oil from the destructive distillation of wood. Penetrol in a spray containing bordeaux mixture and nicotine appears to be safe on foliage in the spring.

HOERNER, J. L. (2235)

1930. PENETROL AS AN ACTIVATOR FOR NICOTINE. Jour. Econ. Ent. 23: 174-177, illus. [Abstract in Rev. Appl. Ent. (A) 18: 403. 1930.]

Penetrol gave consistently better results than potassium fish-oil soap as an activator for nicotine. The dilutions used were Penetrol or fish-oil soap 1 to 400 and nicotine (50-percent) 1 to 10,000. The insects tested were Macrosiphum (Macrosiphoniella) sanborni Gill., Myzus persicae Sulz., and Aphis spiraecola Patch.

------- (2236)

1930. PENETROL AS AN ACTIVATOR FOR NICOTINE. Amer. Fruit Grower Mag. 1930 (July), pp. 8-12, illus. [Abstract in Biol. Abs. 5 (6-7): 1763. Entry 17,958. 1931.]

Penetrol, a sulphonated oxidation product of petroleum, is a liquid easily miscible with water. It has proved much easier to handle, and more effective as an activator than soap solutions, when used with nicotine sprays as a contact insecticide, and it may be used with arsenical sprays and with bordeaux without burning the foliag

PEAIRS, L. M., and GOULD, E. (2237)

1930. NOTES ON THE PISTOL CASE-BEARER. Jour. Econ. Ent. 23: 188-190. [Abstract in Rev. Appl. Ent. (A) 18: 403-404. 1930.]

The most successful contact insecticide for controlling the pistol casebearer (Coleophora malivorella Riley) was nicotine sulphate (1:800) plus 0.5 percent Penetrol, which gave about 100 percent control An emergency application made between July 17 and July 27 at the rate of 15 gal. per tree gave an average kill of 78.92 percent.

PETIT, R. H. (2238)

1930. REPORT OF THE SECTION OF ENTOMOLOGY. Mich. State Bd. Agr. Ann. Rept. 1929-1930, 19 pp., illus. [Abstract in Rev. Appl. Ent. (A) 19: 453. 1931.]

Phenacoccus gossypii Towns. and Ckll. was controlled in greenhouses by a spray of 1 pt. 40-percent nicotine sulphate, 2 qt. penetrol and 100 gal. water.

TISSOT, A. N., and THOMPSON, W. L. (2239)

1930. NEW APHICIDES. Fla. Ent. 14 (1): 7-12. [Abstract in Rev. Appl. Ent. (A) 18: 490. 1930.]

A new pine tar soap was found superior to ordinary soaps as a spreader and carrier of nicotine. Sodium oleate (1 lb. to 100 gal. water) with 40-percent nicotine sulphate 1 to 4,000 gave a good kill of Aphis spiraecola Patch. Good results were also secured with standard oil emulsions (1 percent) with 50-percent free nicotine (1 to 4,000). Penetrol gave promising results at the rate of 0.5 percent with only one-fourth as much nicotine as is necessary with ordinary spreaders. A 2 percent nicotine-lime dust made with free nicotine (50-percent) was just as effective as a 3 percent dust made with 40-percent nicotine sulphate. The gas is given off much more rapidly than from nicotine sulphate, resulting in a high concentration soon after application. The price of these materials depends on their nicotine content, so that the fact that only 4 lb. of free nicotine is required as against 7 1/2 lb. nicotine sulphate for 100 lb. dust gives a reductic in cost in spite of the 25 percent higher cost of the free nicotine.

WATSON, J. R. (2240)

1930. REPORT OF WORK IN ENTOMOLOGY AT THE FLORIDA STATION. Fla. Agr. Expt. Sta. Rept., pp. 67-73, illus. [Abstract in Expt. Sta. Rec. 65: 451-452. 1931.]

In control work with the bean jassid (Empoasca fabae), pyrethrum sprays consistently gave greater immediate kills and showed more lasting effects than did nicotine sulphate sprays used in connection with bordeau mixture, soaps, or the new activators.

The use of So-Fyne, Penetrol, or Grandpa's Wonder Spray as spreaders was found to kill 98 percent or more of the green citrus aphid (Aphis spiraecola) when used with Black Leaf 40 at dilutions as low as 1 to 10,000. The tests indicated that the pyrethrum sprays are not so consistently effective as is nicotine sulphate with spreaders.

ANONYMOUS (2241)

1931. REPORT OF ENTOMOLOGY AT THE OHIO STATION. Ohio Agr. Expt. Sta. Bull. 470, pp. 79-95. [Abstract in Expt. Sta. Rec. 64: 649-652. 1931.]

In tests by C. R. Cutright with nicotine spreaders and activators in work with the apple aphid, potassium oleate, sodium oleate, and Penetrol were found quite efficient in increasing the toxicity of nicotine (pp. 650-651). Because of the excellent results obtained when Penetrol was used with the nicotine sulphate at dilutions of 1 to 4,000 in the laboratory, tests of the effectiveness of this combination in the field were commenced, the results of which are presented in tabular form. The results show that Penetrol and low strength nicotine have decided promise for use in the field.

ANONYMOUS (2242)

1931. ENTOMOLOGY AND PARASITOLOGY. Calif. Agr. Expt. Sta. Rept. 1929-1930, pp. 63-69. [Abstract in Rev. Appl. Ent. (A) 20: 219-220. 1932.]

The best results against the thrips (Hercothrips fasciatus Perg.) on pears were obtained with a 2 percent light oil spray containing nicotine sulphate at 1 to 1,600.

CROWLEY, D. J. (2243)

1931. WORK WITH CRANBERRY INSECTS AT THE CRANBERRY SUBSTATION. Wash. Col Agr. Expt. Sta. Bull. 260, pp. 66-68. [Abstract in Expt. Sta. Rec. 66: 756-757. 1932.]

Good control of oyster-shell scale in the migration stage was obtained by the use of nicotine-oil or pyrethrum-oil combinations. In work with spreaders or stickers, better results were obtained where nicotine and crystal potassium oleate were used than where nicotine and fish-oil soap or nicotine with other combinations were used. In control work with the cranberry fruit worm, the best results were obtained by spraying with Evergreen 1 to 400 plus 0.75 percent summer oil or with nicotine 1 to 400 plus 16 lb. crystal potassium oleate soap when the moths were emerging in July.

DE ONG, E. R. (2244)

1931. REFINED PINE TAR OIL FOR ORCHARD AND GARDEN USE. Jour. Econ. E 24: 736-743. [Abstract in Rev. Appl. Ent. (A) 19: 549. 1931.]

Pine tar oil is used alone or in combination with nicotine or copper resinate for the control of aphids, thrips or the younger stage of unarmored scales. Nicotine in a 95 percent concentration enters readily into solution with pine tar oil, but a difficulty exists in obtaining a solution in the presence of large amounts of water. It is concluded from the data obtained that the highest concentration of nicotine consistent with economy and safety should be used in all such combinations of nicotine and oil.

FELT, E. P., and BROMLEY, S. W. (2245)

1931. TESTS WITH NICOTINE ACTIVATORS. Jour. Econ. Ent. 24: 105-111. [Abstract in Rev. Appl. Ent. (A) 19: 345. 1931.]

A series of field tests were conducted with nicotine in conjunction with Penetrol, Sunoco oil, Volck oil, commercial soap flakes, sodium oleate, potassium oleate, and Kayso calcium caseinate against the spruce gall aphid (*Chermes abietis* L.), black cherry aphid (*Myzus cerasi* F.), spiraea aphid (*Aphis spiraecola* Patch) and certain brown aphids on conifers. The results secured indicate that the efficiency of nicotine activators is dependent on a complex of conditions in which the stage of the insect, the type of the plant, the spreading and wetting qualities of the spray, the rapidity of the evolution of nicotine, and the weather, temperature, and humidity conditions are all factors.

GAMBRELL, F. L. (2246)

1931. THE SPRUCE GALL APHID (*ADELGES ABIETIS*) AS A NURSERY PEST. Jour. Econ. Ent. 24: 355-361. [Abstract in Rev. Appl. Ent. (A) 19: 479-480. 1931.]

Combinations of nicotine with penetrol, soaps and oils, and spray mixtures consisting of either lime-sulphur or soap uncombined have shown promising results against the above aphid (*Chermes abietis* L. without producing any apparent injury to Norway spruce trees in nurseries.

HEADLEE, T. J. (2247)

1931. REPORT OF THE DEPARTMENT OF ENTOMOLOGY. N. J. Agr. Expt. Sta. Rep 1929-1930, pp. 121-200. [Abstract in Rev. Appl. Ent. (A) 20: 81-82. 1932.]

A mixture of oil emulsion and cresylic acid was much cheaper than a mixture of lime-sulphur-nicotine. A number of tests against *Zeuzera pyrina* L. indicated that the larvae can be killed by treating the twigs and branches of infested apple trees with miscible pine oil in which has been dissolved naphthalene, nicotine, or benzyl chloride.

HERBERT, F. B. (2248)

1931. HISTORY OF THE OIL AND NICOTINE COMBINATION. Jour. Econ. Ent. 24: 991-997.

This is mostly a discussion of the literature on the subject. The following is a list of the insects which can be controlled by a combination of oil and nicotine (p. 996): aphids, mealybugs, thrips, whiteflies, psyllids, lacebugs, scale insects, leafhoppers, treehoppers, redbugs, cabbage bugs, plant bugs, spittle bugs, casebearers, red spiders, rust mites, blister mites, sawfly larvae, midges, fleas, chicken lice, leaf roller eggs and larvae, canker worms, caterpillars, bud moths, twig borer larvae and cranberry fireworm.

HERRICK, G. W. (2249)

1931. SOME SHADE-TREE PESTS AND THEIR CONTROL. N. Y. (Cornell) Agr. Expt. Sta. Bull. 515, 26 pp., illus. [Abstract in Rev. Appl. Ent. (A) 19: 435. 1931.]

A nicotine and oil spray already noticed [Rev. Appl. Ent. (A) 14: 477], applied during the first week in July, will control Chionaspis pinifoliae Fitch on pines and spruces. Experiments have shown that the spruce gall aphid (Chermes abietis L.) is destroyed by lime-sulphur, miscible oils, or nicotine sulphate (1:400) with 6 lb. powdered soap to 100 gal. applied in April.

PETROV, A. D., ET AL. (2250)

1931. THE "CONTACT" AS ACTIVATOR OF CONTACT INSECTICIDES. Bull. Plant Protect. 3 (1): 183-187, illus. [In Russian. Abstract in Rev. Appl. Ent. (A) 20: 199-200. 1932.]

Since hundreds of tons of nicotine sulphate, with soft soap as a spreader, are used yearly in the Russian Union in sprays against insect pests, an attempt was made to find a product manufactured in the country with an action similar to that of Inman's "activator", the addition of which to the sprays would permit a decrease in the concentration of nicotine and the exclusion of the expensive soft soap. Two such products are described. The first is a solar oil activator and the other is called "Contact". The latter contains 40 percent sulpho-acids and 15 percent oil.

When used against aphids, nicotine sulphate at 1 to 4,000 with 0.5 percent "Contact" gave much better results than at 5 times this strength in combination with soap and soft water. Nicotine sulphate at 1 to 4,000 with 0.5 percent of the solar oil activator gave slightly poorer results than at a concentration of 1 to 800 with soap and rain water, but was considerably more effective than at the latter concentration with casein and hard water.

RUGGLES, A. G. (2251)

1931. PRELIMINARY NOTES ON THE BIOLOGY AND CONTROL OF THE PINE LEAF SCALE, *CHIONASPIS PINIFOLIAE* FITCH. Jour. Econ. Ent. 24: 115-119. [Abstract in Rev. Appl. Ent. (A) 19: 345-346. 1931.]

Experimental work in 1927 and 1928 showed that this scale could be controlled by careful applications of Volck oil and nicotine, but a further study was begun in 1930 to devise better spraying compounds. Tests showed that it can be controlled in the middle of the hatching season by using 1 percent Volck light oil with nicotine sulphate and nicotine sulphate and soap.

WILCOXON, F., and HARTZELL, A. (2252)

1931. SOME FACTORS AFFECTING THE EFFIENCY OF CONTACT INSECTICIDES. I. SURFACE FORCES AS RELATED TO WETTING AND TRACHEAL PENETRATION. Contr Boyce Thompson Inst. 3 (3): reprint, 13pp., illus. [Abstract in Rev. Appl. Ent. (A) 19: 267-268. 1931.]

The toxicity to *Aphis rumicis* L. of nicotine solutions alone or containing calcium caseinate, penetrol, or sodium oleate was determined and compared with measurements of surface tension and angle of contact. It was found that the toxicity followed the same order as the spreading coefficient.

BRITTON, W. E. (2253)

1932. CONNECTICUT STATE ENTOMOLOGIST, THIRTY-FIRST REPORT 1931. Conn. Agr. Expt. Sta. Bull. 338, pp. 499-603, illus. [Abstract in Rev. Appl. Ent. (A) 20: 701-703. 1932.]

A spray consisting of 1 1/4 gal. lime-sulphur, 1 pt. nicotine sulphate, and 100 gal. water, with 1 lb. iron sulphate added, gave the best results against the adults of leafhoppers (*Typhlocyba pomaria* McAtee) on apples. Tests against aphids showed that variations in temperature and humidity do not affect to any appreciable extent the toxicity of nicotine sulphate when used with an activator, such as penetrol. There is little doubt that the activator increased the toxicity of the spray, although the toxicity of nicotine sulphate at 1 t 2,000 and penetrol at 1 to 200 did not equal that of nicotine sulphate a 1 to 800 alone (p. 702). Aphids (*Myzus circumflexus* Buckt.) were found infesting *Gladiolus* corms in storage. The infestation was controlled by soaking the corms in nicotine sulphate (1:400) for 30 minutes.

DRAKE, C. J., ET AL. (2254)

1932. PRELIMINARY EXPERIMENTS WITH APHIDS AS VECTORS OF YELLOW DWARF. Iowa State Coll. Jour. Sci. 6 (3): 347-355, illus. [Abstract in Rev. Appl. Ent. (A) 20: 706-707. 1932.]

Certain sprays used on onions to control thrips and maggots noticeably lessened the percentage of yellow dwarf infection, especially a combination of 1 to 1.5 percent miscible oil in bordeaux mixture (4:4:50) with 0.1 percent pyrethrum-soap or nicotine sulphate, applied 3 to 5 times at weekly intervals. In some plots the infection was reduced from 60 to 2 percent by this spray.

FELT, E. P., and BROMLEY, S. W. (2255)

1932. INSECTICIDES ON SHADE TREES AND ORNAMENTALS. Jour. Econ. Ent. 25 (2): 298-304. [Abstract in Rev. Appl. Ent. (A) 20: 419-420. 1932.]

The white pine bark aphid (Chermes (Adelges) pinicorticis Fitch) was very satisfactorily controlled with a dormant oil (1:50) to which was added 40-percent nicotine sulphate (1:800). A spray of 2 percent summer oil plus nicotine sulphate (1:800), and a commercial vegetable oil, soap and nicotine sulphate mixture (1:10) gave practically 100 percent kill of the juniper scale (Diaspis carueli Targ.) in midsummer. Control varying from 95 to 100 percent was secured with a number of insects by the application of the vegetable oil, soap, and nicotine spray.

HUTSON, R. (2256)

1932. TESTS SHOW WAY TO CONTROL RASPBERRY MITES. Mich. Agr. Expt. Sta. Quart. Bull. 14 (3): 191-193. [Abstract in Rev. Appl. Ent. (A) 20: 362. 1932.]

Besides the oil sprays, other successful sprays were nicotine and penetrol, derrisol and soap, and glue. The mites discussed are Tetranychus telarius L., T. mcdanieli McGregor, and Paratetranychus ilicis McGregor.

RICHARDSON, H. H. (2257)

1932. A PRELIMINARY STUDY OF THE INSECTICIDAL EFFICIENCY OF THE PYRETHRINS NICOTINE AND ROTENONE AGAINST THE GREENHOUSE RED SPIDER MITE. Jour. Econ. Ent. 25 (3): 592-599. [Abstract in Rev. Appl. Ent. (A) 20: 519. 1932.]

With the addition of 0.25 percent potassium oleate soap, rotenone at 0.02 percent is slightly more toxic than the pyrethrins (0.02 percent); nicotine is much less toxic than either of these two. With sulphonated castor oil as the wetting agent, the pyrethrins and rotenone at 0.02 percent are about equivalent in toxicity; nicotine again is much less toxic, about 0.2 percent being necessary to equal the insecticidal efficiency of the other two at the concentrations given. Soap is more efficient than sulphonated castor oil as a wetting agent for rotenone and the pyrethrins. With nicotine, however, the reverse appears to be true. Nicotine (1:500) makes distinctly alkaline the almost neutral 0.5 percent sulphonated castor oil, but has a relatively slight effect on the already alkaline soap solution.

SPEYER, E. R. (2258)

1932. ENTOMOLOGICAL INVESTIGATIONS. Nursery Market Gard. Independent Devlpmt. Soc. Expt. Res. Sta. 17th Ann. Rept., 1931, pp. 49-55. [Abstract in Rev. Appl. Ent. (A) 20: 483-484. 1932.]

A spray of 1 pt. paraffin emulsion, 10 gal. water, and 2 fl. oz nicotine is an effective means of controlling the onion thrips (*Thrips tabaci* Lind.) when it is exposed on the foliage of cucumber. Infestati of roses by the rose thrips (*T. fuscipennis* Hal.) might probably be cor trolled by a spray of 2 lb. potash soft soap, 10 gal. soft water and 2 fl. oz. nicotine. A mixture of 6 oz. nicotine to 1 gal. sulphonated oi proved very effective in controlling aphids when used at a dilution of 1 to 300.

WATSON, J. R. (2259)

1932. REPORT OF THE DEPARTMENT OF ENTOMOLOGY. Fla. Agr. Expt. Sta. 45 Ann. Rept. 1930-1931, pp. 70-80. [Abstract in Rev. Appl. Ent. (A) 20 647-648. 1932.]

A combination of lime-sulphur (1:40), 1/2 percent penetrol and nicotine sulphate (1:3,000) gave 99 percent mortality against aphids (*Aphis spiraecola* Patch) on *Citrus*. A 2 percent dust of 50-percent free nicotine with lime as a carrier gave good commercial control of melon aphids (*Aphis gossypii* Glov.) on watermelons in the experimental field.

WEBSTER, R. L. (2260)

1932. RED SPIDER CONTROL. Wash. State Hort. Assoc. Proc. 27 (1931), p 17-21. ORCHARD MITES AND THEIR CONTROL. Better Fruit 26 (8): 10-11. [Abstract in Rev. Appl. Ent. (A) 20: 276-277. 1932.]

In the experimental orchards, combinations of oil and pyrethrum or oil and nicotine gave good control of the red spider (*Tetranychus telarius* L.). The last named spray is also effective against the codling moth.

ZECK, E. H., and NOBLE, N. S. (2261)

1932. THRIPS. EXPERIMENTS FOR THE CONTROL OF *THRIPS IMAGINIS* BAGNALL. Agr. Gaz. N. S. Wales 43 (3): 231-236, illus. [Abstract in Rev. Appl. Ent. (A) 20: 374-375. 1932.]

One application of lime-sulphur combined with nicotine sulphate and emulsified oil caused scorching and defoliation of peaches, but did not injure *Citrus* or apple. A combination of nicotine sulphate and miscible white oil commonly recommended for the control of this thrips did not prove satisfactory in laboratory tests.

FLINT, W. P., ET AL. (2262)

1933. ENTOMOLOGY INVESTIGATIONS. Ill. Agr. Expt. Sta. Rept. 46, 1932-1933, pp. 137-163, illus. [Abstract in Rev. Appl. Ent. (A) 22: 356-358. 1934.]

Certain sprays used on onions to control thrips and maggots noticeably lessened the percentage of yellow dwarf infection, especially a combination of 1 to 1.5 percent miscible oil in bordeaux mixture (4:4:50) with 0.1 percent pyrethrum-soap or nicotine sulphate, applied 3 to 5 times at weekly intervals. In some plots the infection was reduced from 60 to 2 percent by this spray.

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With the addition of 0.25 percent potassium oleate soap, rotenone at 0.02 percent is slightly more toxic than the pyrethrins (0.02 percent); nicotine is much less toxic than either of these two. With sulphonated castor oil as the wetting agent, the pyrethrins and rotenone at 0.02 percent are about equivalent in toxicity; nicotine again is much less toxic, about 0.2 percent being necessary to equal the insecticidal efficiency of the other two at the concentrations given. Soap is more efficient than sulphonated castor oil as a wetting agent for rotenone and the pyrethrins. With nicotine, however, the reverse appears to be true. Nicotine (1:500) makes distinctly alkaline the almost neutral 0.5 percent sulphonated castor oil, but has a relatively slight effect on the already alkaline soap solution.

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FLINT, W. P., ET AL. (2262)

1933. ENTOMOLOGY INVESTIGATIONS. Ill. Agr. Expt. Sta. Rept. 46, 1932-1933, pp. 137-163, illus. [Abstract in Rev. Appl. Ent. (A) 22: 356-358. 1934.]

The application against the onion thrips (Thrips tabaci Lind.) of nicotine sulphate or derrisol, each at the rate of 1 to 800 parts of a solution of penetrol and water (1:200) increased the yield of onions by 24 percent (p. 357). Tests showed that a nicotine spray is more effective against the Mexican mealybug (Phenacoccus gossypii Tns. and Ckll.) when it is heated to 120° F, especially where only low-pressure equipment is available.(p. 358).

HUCKETT, H. C. (2263)

1933. THE SPRAY VALUE OF NICOTINE SUPPLEMENTS FOR APHIDS. N. Y. (Geneva) Agr. Expt. Sta. Tech. Bull. 210, 20 pp., illus. [Abstract in Rev. Appl. Ent. (A) 22: 177. 1934.]

The author described the technique and gives the results of greenhouse tests on the effect of adding various proprietary materials as activators to sprays of 40-percent nicotine sulphate against aphids. Increased mortality was obtained in all tests with Penetrol, which was used at the strength of 1 to 200, and with two other miscible mineral oils at 1 to 100 and three soaps at 1 to 150; a miscible pine-tar oil at 1 to 100 was less satisfactory, and a powdered gum was usually ineffect

PARKER, W. B. (2264)

1933. VAPO DUST-A DEVELOPMENT IN SCIENTIFIC PEST CONTROL. Jour. Econ. Ent. 26 (3): 718-720, illus. [Abstract in Rev. Appl. Ent. (A) 21: 473-474. 1933.]

Tests in controlling a serious infestation of the grape leafhopper (Erythroneura comes Say) showed that small quantities of phytonomic oils when combined with a small amount of nicotine were very effective against both nymphs and adults without causing injury to the grape vines.

SCHOENE, W. J. (2265)

1933. SPRAY TESTS FOR THE WHITE APPLE LEAFHOPPER TYPHLOCYBA POMARIA. Jour. Econ. Ent. 26 (2): 325-329. [Abstract in Rev. Appl. Ent. (A) 21: 328. 1933.]

In Virginia a single application of a spray consisting of 1 gal. summer oil and 3/4 pt. 40-percent nicotine sulphate to 100 gal. water proved effective when made while the leafhopper was still in the nymphal stage. A combination consisting of 1/2 gal. penetrol and 1/2 pt. 40-percent nicotine sulphate to 100 gal. water also proved effective against the nymphs, and neither spray caused injury to fruit or foliage.

EDDY, C. O. (2266)

1934. THE ROLE OF SOME SOUTHERN PINE PRODUCTS IN THE CONTROL OF APHIS RUMICIS LINN. Jour. Econ. Ent. 27: 398-400.

Tests with aphids showed that some tars and tar oils added to the toxicity of the cocoanut-oil soap or to the soap-nicotine solutions Tests showed excellent value of cocoanut-oil soap as a toxic agent for aphids and as a spreader for nicotine. In hard waters of Kentucky it is necessary to use 4 parts cocoanut-tar oil spreader per 1,000 parts of water. At this concentration 50-percent nicotine (1 to 3,000) gave commercial control of aphids in a greenhouse.

HUTSON, R. (2267)

1934. OBSERVATIONS ON THE HABITS AND CONTROL OF *GLOSSONOTUS CRATAEGI* (*MEMBRACIDAE*), ON PLUM AND APPLES. Jour. Econ. Ent. 27: 365- 367.

A spray consisting of one gal. of summer oil emulsion plus 1/2 pt. nicotine sulphate in 100 gal. of spray killed approximately 100 percent of the nymphs, as did also a spray consisting of 1/2 pt. nicoti sulphate plus 1/2 gal. of penetrol in 100 gal. of spray. The same oil sprays and nicotine dusts had practically no effect on the adults, and nicotine dusts did not prove effective against the nymphs.

PARKER, W. B. (2268)

1934. RECENT DEVELOPMENTS OF THE VAPO DUST METHOD OF PEST CONTROL. Jou Econ. Ent. 27: 1036-1040.

Nicotine may be incorporated in either the oil or water phase of this new type of insecticide. This method is patented. Nicotine applied by this method proved effective on thrips.

S. NICOTINE DUSTS, 1908-1934

1. Kinds and Early History, 1908-1924

CHIFFLOT (2269)

1908. INSECTES ET MALADIES. Tribune Hort. 3: 374.

A mixture of precipitated sulphur and "Scholesing" nicotine is recommended in Belgium as a dust against aphids on chrysanthemum.

MARCHAL, P. (2270)

1913. *CLYSIA AMBIGUELLA* HB. AND *POLYCHROSIS BOTRANA* SCHIFF. IN 1912. Ann. Serv. Epiphyties (1912). [Paris], pp. 248-252. [In French. Abstract in Rev. Appl. Ent. (A) 2: 410-411. 1914.]

In experiments on *P. botrana* Feytaud has been able to confirm his previous tests regarding the remarkable aborting action of nicotine on the eggs, which makes it superior to other insecticides in vineyard practice. Lead arsenate and nicotine as preventives and pyrethrum and nicotine as curatives are the only substances of much practical value. Dusting is a less effective method than spraying. Nicotined sulphur and quicklime are the best for dusting.

MOREAU, L., and VINET, E. (2271)

1913. REPORTS ON CLYSIA AMBIGUELLA AND ITS SUMMER TREATMENT. Bull. Soc. Agr. France, July 15, pp. 55-56. [Abstract in Rev. Appl. Ent. (A) 1: 337-338. 1913.]

Copper sprays containing 0.133 percent nicotine and made slightly alkaline are recommended. Dusts, including sulphur with nicotine, may be used.

KÖCK, K. (2272)

1914. THE ACTION OF NICOTINE VAPORS ON THE FIRST GENERATION OF VINE MOTHS Ztschr. Landw. Versuchsw. Oesterreich. 17 (6-7): 638-641, illus. [In German. Abstract in Rev. Appl. Ent. (A) 8: 276. 1920.]

Nicotine sprays are in general use against vine moths (Clysia ambiguella and Polychrosis botrana) and a dust containing 0.45 percent nicotine has also given good results. A 5-gallon steam boiler for producing nicotine-impregnated steam is described. Tests have shown that nicotine vapor has bad effects on the workers and does not appear to kill more than half of the moths.

SMITH, R. E. (2273)

[1917.] THE PREPARATION OF NICOTINE DUST AS AN INSECTICIDE. Calif. Agr. Expt. Sta. Bull. 336, pp. 261-274. 1921. [Abstract in Rev. Appl. Ent. (A) 10: 286-288. 1922.]

The first tests with nicotine dust were made in 1917 against the walnut aphid (Chromaphis juglandicola Kalt.) and subsequent tests are here described. The toxicity of the dust is influenced by the form and amount of nicotine used and the nature of the filler. The dust acts as a fumigant. It should be as volatile as possible and give off the maximum amount in the minimum of time, or it should be less volatile and so act more slowly but for a longer time. The former is the better method, even though it loses its efficiency very soon.

The characteristics of fillers are given, and kaolin proved to be the best one to absorb the nicotine and to make a suitable dust. Pure nicotine and nicotine oleate were the best forms of nicotine for this purpose. Dry lime-sulphur, kerosene, and 40-percent nicotine sulphate form a very powerful dust. In liquid form 0.1 percent of nicotine is considered a strong mixture, and in dust, 10 percent. The hotter the weather the greater the effect produced by a given strength of dust.

Promising results were obtained against 8 species of aphids, 3 species of thrips, 2 species of leafhoppers, squash bug, false chinch bug, 7 species of caterpillars, and cucumber beetles.

BRITTAIN, W. H. (2274)

1919. AN INFESTATION OF APPLE SUCKER, PSYLLA MALI SCHMIDB., IN NOVA SCOTI Agr. Gaz. Canada 6 (9): 823-827, illus.

Spraying with nicotine sulphate is recommended, as for *Aphis pomi* or *A. malifoliae*. Should a second application be necessary, it may be made just before the blossoms open so as also to be useful against the green apple bug (*Lygus communis* var. *novascotiensis* Knight).

A number of contact dusts were also tested for comparison with the liquid spray. Nicotine sulphate was the basis of these dusts, this material being mixed and dried and ground with kaolin, yellow clay, or sulphur at the rate of 2 lb. to the 100. The formulas for the first of these was obtained from R. E. Smith of California. Tobacco dust was also tried as well as free nicotine with sulphur. None of the dust mixtures gave results comparable to the liquid spray.

HODGSON, R. W. (2275)

1919. FIGHTING THE WALNUT APHIS. Calif. Cult. 53 (3): 53, illus. [Abstract in Rev. Appl. Ent. (A) 8: 130. 1920.]

A mixture of 74 percent kaolin and 24 percent hydrated lime upon which 2 percent nicotine sulphate has been sprayed kills 95 percent of the walnut aphid (*Chromaphis juglandicola*) when blown upon the trees by a dust sprayer at the rate of 2 to 3 lb. per tree.

SMITH, R. E. (2276)

1919. DUSTING FOR THE WALNUT APHIS. Calif. Agr. Expt. Sta. Rept. 1918-1919, p. 44.

The essential idea in making the material for this purpose consists in impregnating a solid material or carrier with a solution of nicotine, followed by the necessary drying and pulverizing. At present the following method is used: A mixture of 75 percent kaolin and 25 percent hydrated lime is made in a mechanical mixer, and while these materials are being mixed the desired amount of Black Leaf 40 is blown into the mass in a fine spray, without any dilution. For the walnut aphid a mixture containing about 2.5 percent of Black Leaf 40 (1 percent nicotine) is being used. Much greater strengths can be made and other materials such as sulphate, lead arsenate, and copper sulphate may be added. The dust is applied to the trees with large-power-driven blowing machines made for the purpose.

ANONYMOUS (2277)

1922. PLANT PATHOLOGY. Calif. Agr. Expt. Sta. Rept., pp. 118-124, 132-134, 135-138, illus. [Abstract in Expt. Sta. Rec. 48: 541-542, 1923.]

"Notes are given by R. E. Smith on the improvement of Nicodust which is said to be becoming quite extensively used in California."

BRITTAIN, W. H. (2278)

1923. THE EUROPEAN APPLE SUCKER (PSYLLIA MALI SCHMIDBERGER). Nova Scotia Dept. Agr. Bull. 10, 69 pp. [Abstract in Rev. Appl. Ent. (A) 11: 383. 1923.]

Sulphur nicotine dusts are fairly effective but are heavy and difficult to apply with most machines. Copper-lime nicotine dusts are less effective, a large proportion of the nicotine in them remaining inactive. Dusts containing a large proportion of lime are light and easy to apply, and the nicotine in them is more active.

CAMPBELL, R. E. (2279)

1923. NOTES ON NICOTINE DUST PROGRESS. Jour. Econ. Ent. 16: 497-505. [Abstract in Rev. Appl. Ent. (A) 12: 81. 1924.]

A historical account of the use of nicotine in dusts. A bibliography of 50 papers is given.

LOVETT, A. L. (2280)

1923. NICOTINE DUST. Wash. State Hort. Assoc. Proc. 19, pp. 12-18.

The literature on this subject is briefly reviewed, and the author says that he is sold to the general idea of nicotine dusts. In regard to simplicity, ease, and thoroughness of application, as compared with liquid spray, there is no comparison. The following factors are to be considered as handicaps in the successful and general employment of nicotine dusts: temperature, moisture, wind, loss of nicotine, time nicotine is active, and cost.

CARPENTER, C. F. G. (2281)

1924. INSECTS AND INSECTICIDES. Citrus Indus. 5 (2): 11.

The chief contact insecticides, for use against sucking insects, are nicotine, nicodust, nicosulphur dust, lime-sulphur, emulsions, miscible oils, and soaps. Nicodusts and nicosulphur dusts are now widely used with excellent results. The nicosulphur dusts control mildew and other fungous diseases as well as plant lice.

2. Preparations of Dusts, Dusting Machinery, and Principles Involved, 1921-1932

CAMPBELL, R. E. (2282)

1921. NICOTINE SULPHATE IN A DUST CARRIER AGAINST TRUCK CROP INSECTS. U. S. Dept. Agr. Dept. Circ. 154, 15pp., illus. [Abstract in Rev. Appl. Ent. (A) 9: 389-390. 1921.]

The use of nicotine sulphate in dust form having been successful in controlling Chromaphis juglandicola Kalt. (walnut aphid) experiments were carried out with this insecticide against the following pests:

Aphis gossypii Glov. (melon aphid); *Brevicoryne* (A) *brassicae* L. (cabbage aphid); *Acyrthosiphon* (*Macrosiphum*) *pisi* Kalt. (pea aphid); *Thrips tabaci* (onion thrips); *Diabrotica soror* Lec. (western twelve-spotted cucumber beetle); and *D. trivitatta* Mannh. (western striped cucumber beetle). The process of manufacture, the type of dusting machine used, and the results of the experiments are described. For the control of aphids other than *Aphis juglandicola* Kalt. a higher strength of nicotine sulphate than 2 percent is necessary and for *Acyrthosiphon pisi* Kalt, a 10 percent strength should be carefully applied, this aphid being most resistant to nicotine. The material used against the cucumber beetles was a 10-percent strength of nicotine sulphate (40-percent) in a carrier of kaolin and lime. Dusts are more effective and cheaper than spray

ESSIG, E. O. (2283)

1921. DUST INSECTICIDES IN CALIFORNIA. Jour. Econ. Ent. 14: 392-394. [Abstract in Rev. Appl. Ent. (A) 10: 131. 1922.]

Black Leaf 40 used as a dust, has proved successful in the treatment of various aphids at a strength of 5 or 6 percent. Against the rosy apple aphid (*Aphis malifoliae* Fitch) dusting was begun as the leaf buds opened. A dust containing 6 percent Black Leaf 40 was sufficient against melon aphid (*Aphis gossypii*), *Nysius ericae* Shill., and nymphs of *Typhlocyba* (*Erythroneura*) *comes* Say. Adults of the latter were killed by a 10-percent mixture.

The caterpillars of various Lepidoptera also readily succumb to Nicodust treatment, including those of *Malacosoma* spp. (tent caterpillars), *Pseudohazis eglanterina* Boisd. (brown day moth), *Hypantria cunea* Drury (fall webworm), and *Pyrameis* (*Vanessa*) cardui L.

Lime liberates the volatile nicotine more readily than kaolin and is therefore used in preference to the latter as a base for nicotine dusts. The addition of dry sulphur also increases the efficacy of the dust. Black Leaf 40 and sulphur without lime are more efficacious than nicotine and lime without sulphur, but the former mixture, owing to its weight, is not so easily handled in the dusting machines. Nicodust and powdered lead arsenate efficiently controlled caterpillars and flea beetles, especially the latter on tomatoes.

HARTZELL, F. Z. (2284)

1921. PEAR PSYLLA INVESTIGATIONS DURING 1920. N. Y. State Hort. Soc. Proc. 66th Ann. Meeting, pp. 50-57. [Abstract in Rev. Appl. Ent. (A) 10: 211. 1922.]

A spray containing 2 gal. lime-sulphur, 40 lb. hydrated lime and 1 pt. Black Leaf 40 per 100 gal. water killed 97.9 percent of the nymphs (*Psylla pyricola* Förster). Where 60 lb. of kaolin was substituted for lime the foliage was considerably injured. Bordeaux mixture 4-40-100 and nicotine even when used with an excess of lime caused serious russeting of the fruit. Dusts composed chiefly of sulphur and containing 3 percent nicotine killed only 61.7 percent of the nymphs. Recommendations for nicotine sprays are given.

MORRILL, A. W. (2285)

1921. NOTES ON THE USE OF NICOTINE DUSTS. Jour. Econ. Ent. 14 (5): 394-400. [Abstract in Rev. Appl. Ent. (A) 10: 131-132. 1922.]

"As a result of the conflicting reports with regard to the effectiveness of nicotine dusts against grape leaf hoppers (Typhlocyba comes) further experiments were undertaken, details of which are described. In the dust tested, 7 1/2 percent and 10 percent of Black Leaf 40 were used, the analyses showing 2.4 percent and 3.8 percent of nicotine respectively. In the former the carrier consisted of 90 percent hydrated lime and 10 percent sulphur, and in the latter about 75 percent sulphur and 25 percent lime. Ordinary nicotine dusts appear to be of little value against the adults, but stupefy the nymphs and cause them to drop. If there are no runners on the ground, and in the case of trellised vines, this is probably equivalent to killing them.

"The results obtained against the melon-aphis (Aphis gossypii, Glov.) are similar to those recorded by Campbell (Rev. Appl. Ent. (A) 9: 389). For scattered infestations the author advises dusts with not less than 7 1/2 percent Black Leaf 40. In the case of a general infestation throughout the field it is advisable to use a dust containing only 4 or 5 percent Black Leaf 40. The importance of locating incipient colonies of aphids by scouting early in the season, is emphasized. For cantaloupe plants the dust should not contain more than 10 percent sulphur to prevent scorching.

"The dust does not apparently affect natural enemies such as Hippodamia convergens and Syrphid larvae or the Hymenopterous parasite Aphidius testaceipes.

"Contrary to the results obtained by Parrott (Rev. Appl. Ent. (A) 9: 352) colonies of the woolly apple aphis (Eriosoma lanigerum) were completely eradicated on small trees with dust blown from a distance of 3 or 4 feet with not enough air pressure to disarrange the waxy covering of the insects. The dust remained attached to the wax, though it was hardly visible to the naked eye."

OSBORN, H. T. (2286)

1921. A DUST INSECTICIDE AGAINST LEAFHOPPERS. Hawaiian Planters' Rec. 25: 167-170. [Abstract in Rev. Appl. Ent. (A) 10: 29-30. 1922.]

Nicotine dust is rather more effective than nicotine spray for the control of the sugarcane leafhopper (Perkinsiella saccharicida). The dust contained not less than 5.9 percent nicotine sulphate, 44 percent inert carrier and 50 percent sulphur dust; this was applied by a hand duster. The spray used for comparison was 1 pt. nicotine sulphate to 1,000 pt. water with about 2 lb. whale-oil soap to every 50 gal. water; an ordinary knapsack sprayer being used.

PARROTT, P. J., GLASGOW, H., and MACLEOD, G. F. (2287)

1921. CONTROL OF APPLE RED BUGS BY DUSTING. N. Y. Agr. Expt. Sta. Bull. 490, 30 pp., illus. [Abstract in Rev. Appl. Ent. (A) 10: 363-364. 1922.]

Nicotine sulphate at the strength of 1/4 or 1/2 pt. to 100 gal. of either soap or lime sulphur solution showed considerable toxicity. Dusts containing 0.25, 0.50, 1.0, and 2.0 percent nicotine were toxic to the bugs. Tobacco dust either alone or with soap or lime sulphur solution showed a high degree of toxicity. These apple redbugs (Lygidea mendax Reut. and Heterocordylus malinus Reut.) are more efficiently and economically dealt with by spraying than by dusting.

Temperatures ranging from 44 to 87° F. and moisture on foliage apparently had no influence on the toxic properties of dusting mixtures.

ZIMMERLEY, H. H., GEISE, F. W., and WILLEY, C. R. (2288)

1921. DUSTING VEGETABLE CROPS IN EASTERN VIRGINIA. PRELIMINARY REPORT. Va. Truck Expt. Sta. Bull. 35 and 36, pp. 193-208, illus. [Abstract in Rev. Appl. Ent. (A) 10: 559-560. 1922.]

Under both laboratory and field conditions hydrated lime, kieselguhr, and kaolin as carriers of nicotine proved of equal value in aphid control, lime being the cheapest. In the laboratory 3 percent nicotine dust proved the most effective in the control of Myzus persicae, Macrosiphum solanifolii, Brevicoryne brassicae, and Aphis gossypii. Taking the average for these four species of aphids, the 1, 2, and 3 percent nicotine impregnated dusts killed 72.2, 82.1, and 89.3 percent respectively. For the two first-named aphids on spinach a hydrated lime carrier with 2 percent nicotine impregnated dust proved the most economical. The quantity necessary ranged from 30 to 40 lb. per acre.

BRITTAIN, W. H. (2289)

1922. THE APPLE SUCKER (PSYLLA MALI SCHMIDBERGER). Jour. Econ. Ent. 15: 96-101. [Abstract in Rev. Appl. Ent. (A) 10: 307-308. 1922.]

Nicotine sulphate 3/4 pt. to 100 gal. water is recommended against the nymphs. Very good results were also obtained with a dust containing 2 percent or more of nicotine sulphate (40 percent nicotine) with sulphur as a base. The effectiveness was increased by the addition of lime. Clay used in place of sulphur gave inferior results. Under favorable conditions the adults were killed by fumigation with waste tobacco free from incombustible material at the rate of 360 lb. to the acre.

CAMPBELL, R. E. (2290)

1922. NICOTINE DUST FOR CONTROL OF TRUCK-CROP INSECTS. U. S. Dept. Agr. Farmers' Bull. 1282, 24 p., illus. [Abstract in Rev. Appl. Ent. (A) 12: 179. 1924.]

The advantages of nicotine dust over liquid sprays for the control of injurious insects on vegetable crops are pointed out and instructions in its preparation and use are given, with descriptions of suitable machinery.

HAMILTON, C. C. (2291)

1922. NEW DEVELOPMENTS IN THE CONTROL OF TRUCK CROP INSECTS. Md. Agr. Soc. Rept. 7, pp. 346-352.

In the use of nicotine dusts, hoods or cloth trailers have been used with excellent success to confine the dust for a longer time around the insect and cause a thorough distribution to all parts of the infested plant. A cloth trailer from 10 to 15 ft. long may be used on a power or traction duster in dusting most crops with a nicotine dust (p. 348). The striped cucumber beetle (p. 349), cucumber aphid, and pea aphid (p. 350) have been controlled with nicotine dusts.

HARTZELL, F. Z. (2292)

1922. PEAR PSYLLA PROBLEMS. N. Y. State Hort. Soc, Proc. 67th Ann. Meeting, pp. 50-55. [Abstract in Rev. Appl. Ent. (A) 10: 325-326. 1922.]

Nicotine dust killed older nymphs and adults (Psylla pyricola) but did not kill younger nymphs enveloped in honeydew. Lime-nicotine and sulphur-nicotine dusts gave equal control but the lime dust covered better. Spraying with 2 1/2 gal. lime-sulphur, 50 lb. hydrated lime, 1 pt. nicotine sulphate, and 100 gal. water at a pressure of 300 lb. an average of 5.3 gal. being used per tree, gave a killing efficiency of 98.7 percent. The conclusions arrived at are that a heavy lime-nicotine spray, when thoroughly applied at the proper time, will kill 98 percent or more of the first brood.

HEADLEE, T. J. (2293)

1922. SPRAYING VERSUS DUSTING OF WHITE POTATOES FOR THE CONTROL OF THE PINK AND GREEN LICE INFESTING THEM. N. J. Dept. Agr. Bull. 31, pp. 218-220.

Field experiments indicate that as high a percentage of aphids on potatoes can be destroyed with nicotine dust as can be killed with nicotine sprays, but rainy weather interferes with dusting. The best mixture probably consists of 90 percent good hydrated lime, 5 percent ground burned lime and 5 percent Black Leaf 40, making a hydrated ground burned lime mixture impregnated with 2 percent nicotine.

HEADLEE, T. J., ET AL. (2294)

1922. REPORT OF THE DEPARTMENT OF ENTOMOLOGY. N. J. Agr. Expt. Sta. Rept. pp. 411-475, illus. [Abstract in Expt. Sta. Rec. 51: 658-659. 1924.]

This report includes "A Study of Dust Carriers for Nicotine" by W. Rudolfs (pp. 445-449). Nicotine dusts composed of Milltown ball clay No. 9 and ground burned lime as a carrier will kill a slightly higher percentage of the pink and green aphids (Macrosiphum solanifolii) of the potato and tomato than can be destroyed with the regular nicotine soap and water plant-louse spray. Dolomite was the best carrier found in this study.

HEADLEE, T. J., and RUDOLFS, W. (2295)

1922. SOME FURTHER EXPERIENCE WITH CONTACT DUSTS. Jour. Econ. Ent. 15: 75-81. [Abstract in Rev. Appl. Ent. (A) 10: 304-305. 1922.]

The two great disadvantages of nicotine delivered as a dust are that rain falling within the first 72 hours seems to reduce if not entirely stop its action and the cost is greater than that of a substance that is as effective when delivered in a spray form. A 2 percent nicotine-clay-calcium oxide dust kills 87 percent of the pink and green aphids (Macrosiphum solanifolii) while under the same conditions the spray will kill slightly over 85 percent. A 1 percent nicotine calcium oxide dust kills nearly 84 percent. The maximum efficiency of the dust is reached between 24 and 72 hours after application, while the spray reaches a high point of toxicity within 24 hours. The improvement of the nicotine dust is to be sought in the more rapid evolution of the 2 percent or less of nicotine which is within the range of reasonable practice.

PARROTT, P. J. (2296)

1922. CONTROL OF SUCKING INSECTS BY DUSTING. Jour. Econ. Ent. 15: 82-85. [Abstract in Rev. Appl. Ent. (A) 10: 305-306. 1922.]

Dusting mixture containing 0.25, 0.5, 1.0 and 2.0 percent nicotine proved toxic to the apple redbug (Lygidea mendax Reut.) and the dark redbug (Heterocordylus malinus Reut.). Spraying with nicotine sulphate, 1 to 800, plus 6 lb. soap to 100 gal. gave good control of the currant aphid (Myzus ribis L.). A 90 to 10 sulphur-lead arsenate dust carrying 0.5, 1.0 or 2.0 percent nicotine also afforded efficient protection.

The formula advocated against the cabbage aphid (Brevicoryne (Aphis) brassicae) and cabbageworm (Pieris rapae L.) is nicotine sulphate 5 lb. powdered lead or calcium arsenate 15 lb. and hydrated lime 80 lb.

Macrosiphum solanifolii Ashm. (potato aphid) is the most difficult species to control. Dehydrated copper lead arsenate containing

2 percent nicotine used at the rate of 50 lb. per acre killed 52.3 percent of the aphids infesting the tips of the growing shoots and 83.2 percent when used at the rate of 90 lb. per acre. Nicotine and soap used at the rate of 100 lb. per acre destroyed 85.5 percent.

ANONYMOUS (2297)

1923. SCIENCE SERVES WISCONSIN FARMS. Wis. Agr. Expt. Sta. Bull. 352, 122 pp., illus.

J. E. Dudley made exhaustive tests by using nicotine sulphate in dust carriers against the eggs, larvae, or adults of the following insects; squash bug, Colorado potato beetle, potato flea beetle, onion thrips, turnip aphid, melon aphid, two species of cabbageworms (pp. 68-70), and striped cucumber beetle (p. 71).

Fluke and Dudley conducted tests with nicotine dusts against the pea aphid, and when power dusters were used the percentage killed ranged from 55 to 95, depending somewhat on the percentage of nicotine in the dust, the temperature, and the absence or presence of wind (p. 72).

CHITTENDEN, F. H. (2298)

1923. THE STRIPED CUCUMBER BEETLE AND HOW TO CONTROL IT. U. S. Dept. Agr. Farmers' Bull. 1322, 16 pp., illus. [Abstract in Rev. Appl. Ent. (A) 11: 369. 1923.]

Nicotine dust is recommended for the control of Diabrotica vittata F. on Cucurbitaceae. This consists of 4 lb. nicotine sulphate (40 percent nicotine) and 96 lb. calcium hydrate, or 72 lb. kaolin and 24 lb. lime. The most effective machine for its application is of the knapsack bellows type and it should be applied thick enough to form a good covering on the plants and the surface of the ground about their base (about 1/4 - 1/2 oz. per hill).

DUDLEY, J. E., WILSON, H. F., and MECUM, W. D. (2299)

1923. NICOTINE DUST KILLS CUCUMBER BEETLES. Wis. Agr. Expt. Sta. Bull. 355, 10 pp., illus. [Abstract in Rev. Appl. Ent. (A) 11: 544-545. 1923.]

Nicotine dust is the most effective remedy against the striped cucumber beetle (Diabrotica vittata F.). Dusts containing copper sulphate or gypsum with a lime carrier retain their strengths and are effective under all conditions. A 10 percent nicotine sulphate dust would be preferable but is unobtainable and 5 percent is used. Nicotine dusts with active carriers such as hydrated lime and unslaked lime lose strength rapidly and are only effective under the most favorable conditions. For small plants 14 lb. of dust to the acre is sufficient. Dusting will be most successful in windless weather at a temperature of 65° F. or higher.

HEADLEE, T. J. (2300)

1923. THE MAINTENANCE OF A SPRAY COATING ON FRUIT AND FOLIAGE OF APPLES AS A MEANS OF CONTROLLING CURCULIO AND CODLING MOTH WHERE THE LATTER IS PARTICULARLY ABUNDANT AND THE PRESENT STATUS OF NICOTINE DUSTS. Peninsula Hort. Soc. [Del.] Trans. 36: 15-21. 1922. illus.

The value of nicotine dust is not measured by the amount of nicotin which it contains, but by the number of pounds of nicotine which it will deliver under the conditions under which it must be used.

HEADLEE, T. J., and RUDOLFS, W. (2301)

1923. SOME PRINCIPLES WHICH UNDERLIE THE MAKING AND USE OF NICOTINE DUST. N. J. Agr. Expt. Sta. Bull. 381, 47 pp., illus. [Abstract in Rev. Appl. Ent. (A) 12: 31-33. 1924.]

Dolomite and hydrated lime with 10 to 30 percent dolomite are the best carriers for nicotine sulphate.

Field experiments with Acyrthosiphon (Macrosiphum) pisi indicate that a minimum of 50 pounds of 1.5 percent free nicotine dolomite dust should be used for 1 acre of infested peas where these are planted in solid rows 40 inches apart. Against M. solanifolii at least 30 lb. of this dust per acre should be applied. No satisfactory results were obtained with the dust against Thrips tabaci (onion thrips) and it was also relatively inefficient against Myzus persicae (peach aphids) on pepper plants.

PARROTT, P. J., and MACLEOD, G. F. (2302)

1923. TOBACCO DUST AS A CONTACT INSECTICIDE. Jour. Econ. Ent. 16: 424-430. [Abstract in Rev. Appl. Ent. (A) 11: 582-583. 1923.]

Tests were made to determine the effectiveness of tobacco dust against the aphid Myzus persicae Sulz. on Caryopteris mastacanthus in a greenhouse. Finely ground (200-mesh) tobacco is more effective than coarsely ground (50-mesh). Hydrated lime in combination with tobacco dust promotes the liberation of nicotine and improves the physical condition of the dust but in general such mixtures have decreased toxicity. Tobacco dust alone was somewhat less toxic than mixtures containing free nicotine or nicotine sulphate. Free nicotine dust was more rapid in its paralyzing effect than dusts containing nicotine sulphate, and tobacco dust was the least rapid in dislodging the insects. Mixtures in which kaolin was incorporated as a carrier of free nicotine or nicotine sulphate showed less than 80 percent killing efficiency, while the preparations using sulphur and calcium carbonate or hydrated lime as carriers of the nicotine were decisively more efficient.

PHILLIPS, E. H., and SMITH, E. H. (2303)

1923. PLANT PATHOLOGY. Calif. Agr. Expt. Sta. Rept. for 1923, pp. 179-187, illus.

Under the heading "Improved Method of Making Nicotine Dust," the obstacle to the use of nicotine dust is discussed, but these difficulties have now been largely obviated by the development at the California station of a self-mixing dusting machine, in which the raw materials are placed in the field and the mixing and application carried on at one operation. This cuts the cost to less than half that of factory-mixed dust and at the same time produces a more efficient material (p. 181).

SMITH, R. E., and MARTIN, J. P. (2304)

1923. A SELF-MIXING DUSTING MACHINE FOR APPLYING DRY INSECTICIDES AND FUNGICIDES. Calif. Agr. Expt. Sta. Bull. 357, pp. 497-506, illus. [Abstract in Rev. Appl. Ent. (A) 11: 392. 1923.]

A machine was devised for mixing the ingredients that effects great saving in expense and entails no loss of nicotine nor carrying over of mixtures and consequent deterioration after the season has ended. With this machine it is possible to apply the dust hot and to mix in any desired proportions.

WATSON, J. R. (2305)

1923. REPORT OF THE ENTOMOLOGIST. Fla. Agr. Expt. Sta. Rept. 1922-1923, pp. 103R - 113R. [Abstract in Rev. Appl. Ent. (A) 12: 492-493. 1924.]

High-power dusting against thrips is not successful, but a bellows type of hand duster using dusts of nicotine sulphate and lime was both practical and economical. Against mealybugs (Pseudococcus spp.) oil emulsions and lime-sulphur were used, but a 1-percent solution of carbolic acid, kerosene emulsion (1 to 15), and a solution of 1 qt. nicotine sulphate with 6 to 8 lb. soap per 200 gal. water, all gave good results. For dusting bean leafhoppers (Empoasca mali LeB.), hydrated lime with 10 percent dusting sulphur, impregnated with 2.5 percent of nicotine in the form of nicotine sulphate, gave good results against the nymphs but had little effect on the adults. Bordeaux mixture, to which nicotine sulphate was added, killed adults as well as nymphs. Kaolin was not so satisfactory as a carrier.

ZAPPE, M. P., and STODDARD, E. M. (2306)

1923. RESULTS OF DUSTING VERSUS SPRAYING IN CONNECTICUT APPLE AND PEACH ORCHARDS IN 1922. Conn. Agr. Expt. Sta. Bull. 245, pp. 229-243. [Abstract in Rev. Appl. Ent. (A) 11: 381. 1923.]

A liquid spray, consisting of 3 gal. commerical lime-sulphur, 3 lb. dry lead arsenate, and 3/4 pt. nicotine sulphate to 100 gal.

water, may be relied upon to give the best results. The best dust mixtures for controlling aphids, redbugs, curculio (Conotrachelus nenuphar), codling moth, and other chewing insects consists of 65 percent superfine dusting sulphur, 10 percent lead arsenate, 5 percent nicotine sulphate, and 20 percent carrier.

CORY, E. N., and POTTS, S. F. (2307)

1924. THE CONTROL OF TRUCK CROP PESTS BY DUSTING. Md. Agr. Expt. Sta. Bull. 261. pp. 121-155, illus. [Abstract in Rev. Appl. Ent. (A) 12: 244-245. 1924.]

Against Aphis gossypii Glov. (melon aphid) the application of a 2 percent nicotine dust from a sulphate source used at the rate of 25 lb. to the acre produced a mortality of almost 100 percent. Fairly good results against garden flea hopper (Halticus citri Ashm.) were obtained with a 2 percent dust when used at the rate of 50 lb. to the acre. In a box fumigator only 10 to 12 lb. nicotine dust per acre are required to control Aphis gossypii. Nicotine dust was also used against cucumber beetle Diabrotica vittata F.

Against the bean aphid (Aphis rumicis L.) a 3 percent nicotine dust (sulphate source) at the rate of 40 lb. per acre is recommended while against the asparagus beetles Crioceris asparagi Oliv. and C. duodecimpunctata L. a 2 percent nicotine dust made from either a sulphate or a free nicotine source may be used.

DRAKE, C. J., and FENTON, F. A. (2308)

1924. MELON AND CUCUMBER INSECTS. Iowa Agr. Expt. Sta. Circ. 90, 8 pp., illus. [Abstract in Rev. Appl. Ent. (A) 12: 446. 1924.]

The preparation of nicotine dust is described.

HARTZELL, F. Z. (2309)

1924. DUSTING AND SPRAYING TO CONTROL GRAPE ROOT-WORM. N. Y. (Geneva) Agr. Expt. Sta. Bull. 519, 29 pp., illus.

Preparations containing intimate mixtures of various proportions of monohydrated copper sulphate, hydrated lime, and lead arsenate, known as Sander's dusts, were used in most of the field tests. In order to determine the value of nicotine for the control of the root-worm (Fidia viticida Walsh), a Sander's dust containing 2 percent nicotine and a lime-nicotine preparation with 2.2 percent nicotine were tried. The addition of nicotine to these dusts did not increase their effectiveness (pp. 3-4).

HEADLEE, T. J. (2310)

1924. INSECTICIDES FOR THE POTATO CROP. N. J. Dept. Agr. Bull. 39, pp. 178-184, illus. [Abstract in Rev. Appl. Ent. (A) 14: 157. 1926.]

The pink and gree potato aphid (Macrosiphum solanifolii Ashm.) can be controlled by spraying with nicotine soap and water or with bordeaux mixture containing 1 gal. 40 percent nicotine sulphate in 500 gal. of the spray, or by dusting with 30 lb. of 1 1/2 percent free nicotine dolomite dust or 2 to 2 1/2 percent nicotine sulphate dolomite lime dust per acre. For a 2 percent nicotine dust the materials are hydrated lime, ground dolomite (magnesium limestone) 100 mesh fine and 40-percent nicotine sulphate in the proportions 57: 19: 4.

HEADLEE, T. J. (2311)

1924. REPORT OF THE DEPARTMENT OF ENTOMOLOGY. N. J. Agr. Expt. Sta. 44th Ann. Rept. 1923, pp. 265-337, illus.

In a report on the codling moth, curculio, aphids, and pear psylla (pp. 269-284), 40-percent nicotine was used in many of the sprays.

In a report on nicotine dust (pp. 286-293), it is believed that the best average results are likely to follow the use of nicotine dust, the nicotine of which is drawn from free nicotine sources (p. 293).

HEADLEE, T. J., and RUDOLFS, W. (2312)

1924. SOME FURTHER FACTS RELATIVE TO THE PRINCIPLES UNDERLYING THE MAKING AND USE OF NICOTINE DUST. N. J. Agr. Expt. Sta. Bull. 400, 44 pp., illus., New Brunswick. [Abstract in Rev. Appl. Ent. (A) 13: 386-387. 1925.]

"Since the authors' previous paper (Rev. Appl. Ent. (A) 12: 31) further observations have been made on the evolution of nicotine gas from dusts under field conditions and its effects on Illinoia (Macrosiphum) pisi, and also on the influence of temperature, relative humidity, size of particle of the carrier and thickness of nicotine layer on the particles. For the field tests a special apparatus had to be constructed, details of which are described. The dusts were applied with a Leggett traction duster at the rate of 45 lb. per acre on rows of peas that were in practically full blossom. Three nicotine dusts were used: ground magnesium limestone (dolomite) impregnated with sufficient free nicotine to insure a 1 1/4 percent actual nicotine content, and "Black Leaf F_1" and "Black Leaf F_2", guaranteed 1 1/4 and 2 percent actual nicotine content respectively. An extremely rapid delivery of nicotine gas is more effective than one that is slower but longer continued. A temperature of 70° F. or higher is necessary to promote a rapid evolution of nicotine gas from the dusts under field conditions; below this point evolution decreases and at 50° F. there is practically no evolution whatever. The escape of the gas from the free nicotine-dolomite dust is materially more rapid than from the Black Leaf products. At 70° F. or above, free nicotine dolomite dust, even when applied at the rate of 50 lb. per acre, evolves practically all of its nicotine in 6 hours. The great bulk escapes in the first three hours.

One of the factors involving retardation or acceleration of nicotine evolution from a dust carrier is the size of its particles, the gas escaping more rapidly from coarse material; the ordinary 100-mesh dolomite gives about the average evolution. The fact that under certain conditions, especially with high temperatures, sulphur and nicotine dust is equal to or better than hydrated lime and nicotine dust might be explained by the difference in structure or compactness of the particles. The thickness of the film of nicotine on the particle makes a difference in the rate of nicotine gas evolution, and within limits thinner films give off gas more rapidly. High atmospheric moisture appears to retard nicotine evolution. Under semi-arid conditions free nicotine appears to be far more effective than nicotine sulphate.

"The percentage of kill and percentage of reduction of the aphids vary with the rate of evolution of nicotine gas; when the rate of gas evolution is practically constant, the use of higher-content dusts is likely to be followed by a higher percentage of kill and reduction, because the charge in the atmosphere about the insects is greater."

HORSFALL, J. L. (2313)

1924. THE CONTROL OF PLANT LICE ON VEGETABLES. Pa. Agr. Expt. Sta. Bull. 186, 16 pp., illus. [Abstract in Rev. Appl. Ent. (A) 12: 328. 1924.]

The spinach aphid (Myzus persicae Sulz.) and the false cabbage aphid (Aphis pseudobrassicae Davis) are easily controlled by nicotine sprays or dusts. Spraying is cheaper, the formula recommended being 1 1/2 pt. 40-percent nicotine sulphate, 5 lb. laundry soap and 100 gal. water. In dusting the best results were obtained with free nicotine dust containing 1.25 percent actual nicotine and nicotine sulphate dust containing 2 percent actual nicotine. The following formulas are recommended: 95 lb. superfine hydrated lime to 5 lb. nicotine sulphate; or 50 lb. superfine hydrated lime, 45 lb. dolomite and 5 lb. nicotine sulphate. The amount of dust applied per acre ranges between 30 and 60 lb.

KELSALL, A. (2314)

1924. DUSTS AND DUSTING IN CROP PEST CONTROL. Sci. Agr. 5 (2): 37-51. [Abstract in Rev. Appl. Ent. (A) 12: 540. 1924.]

Dusting machinery may be used to project vapors of nicotine, tetrachloroethane, and hydrocyanic acid.

PARROTT, P. J., and HARMAN, S. W. (2315)

1924(?) COMPARATIVE EFFICIENCY OF DUST AND SPRAY MIXTURES IN CONTROLLING THE CURRANT APHIS. N. Y. Agr. Expt. Sta. Bull. 517, 21 pp., illus. [Abstract in Rev. Appl. Ent. (A) 13: 30-31. 1925.]

The spray formula recommended for the control of Myzus ribis L. on currants is 1 pt. nicotine sulphate, 5 lb. soap and 100 gal. water. Hydrated lime or superfine dusting sulphur should be used as the carrier in preparing home-made nicotine sulphate dusts. Dusting should be done as far as possible on still days, when temperatures are high and there is as little moisture as possible on the foliage.

VORHIES, C. T. (2316)

1924. THE GRAPE LEAF-HOPPER IN ARIZONA. Ariz. Agr. Expt. Sta. Timely Hints for Farmers No. 146, 14 pp., illus. [Abstract in Rev. Appl. Ent. (A) 12: 304-305. 1924.]

Measures against the adults of Erythroneura comes Say are usually not successful, spraying being practically useless, as they are very active and also resistant. Dusting with two machines at once was fairly successful, one man and machine driving the adults out of the vine to the opposite side. The dust used must contain 7 1/2 to 10 percent of nicotine and must be applied on a warm, calm day. The most effective measure is to spray the nymphs with 40-percent nicotine sulphate, 1/2 pt. to 100 gal. water (or double this strength), with soap at the rate of 4 lb. to 100 gal. Suitable machines for spraying and dusting are described. Dusting was the cheaper method and was effective when thoroughly done.

WATSON, J. R. (2317)

1924. THE APHIS SITUATION. Citrus Indus. 5 (6): 20.

The experience of A. H. Beyer in Florida is that the most efficient insecticide against the new citrus aphid is nicotine sulphate-lime dust. On small trees it is best applied with a good hand duster.

Spraying with lime-sulphur and nicotine sulphate solution, or oil emulsions, have also given good results. We advise this method of combating the aphid in groves that need spraying for scale and whitefly. In groves in which rust mite is appearing, spray with a solution of one part of nicotine sulphate to 800 parts of standard lime-sulphur solution.

WATSON, J. R., and BEYER, A. H. (2318)

1924. THE NEW CITRUS APHID. Citrus Indus. 5 (11): 30-31.

Spraying with nicotine sulphate (1 to 800) was quite successful against this aphid (Aphis spiraecola Patch or possibly A. pomi) when the spray was applied before the infestation had curled the leaves. The most practical means of control, after the leaves are curled, seems to be by the use of nicotine dust of at least a 3-percent strength. Take 100 lb. hydrated lime and add 7.5 lb. of 40-percent nicotine sulphate. This should be put in a 50-gal. barrel, which may be arranged like an old fashioned churn, and thoroughly mixed (p. 31).

YOTHERS, W. W., and COLE, F. R. (2319)

1924. THE CITRUS APHID, APHIS SPIRAECOLA PATCH. Citrus Indus. 5 (10): 6-8, 18, 19, illus. [Abstract in Rev. Appl. Ent. (A) 13: 506. 1925.]

Oil emulsions are apparently cheaper than nicotine sulphate (1:800) spray with soap, and both sprays killed the aphids hit by them. Good results were also obtained with a dust of 2 percent nicotine, 40 percent sulphur, and 58 percent inert ingredients.

BEYER, A. H. (2320)

1925. REPORT OF THE ASSISTANT ENTOMOLOGIST. Fla. Agr. Expt. Sta. Rept. 1924-1925, pp. 39R-41R. [Abstract in Rev. Appl. Ent. (A) 14: 629. 1926.]

A copper sulphate and lime dust plus 3 percent nicotine did not adhere so well as the bordeaux mixture. Under the hood of the spraying device (Rev. Appl. Ent. (A) 10: 532) the dust was about equal to the spray in the percentage of insects killed, but its effects were not so lasting, as the bordeaux mixture acts as a repellent.

HAWLEY, I. M. (2321)

1925. ENTOMOLOGY. Utah. Agr. Expt. Sta. Bien. Rept. 1923-1924, Bull. 192, pp. 42-44. [Abstract in Rev. Appl. Ent. (A) 13: 505. 1925.]

A dust of nicotine sulphate and a finely powdered carrier such as lime, sulphur, or gypsum gave good results against several species of aphids.

WHITTINGTON, C. E. (2322)

1925. DUSTING FOR CONTROL OF THE CITRUS APHID. Citrus Indus. 6 (6): 6. [Abstract in Rev. Appl. Ent. (A) 14: 427. 1926.]

A 3 percent nicotine sulphate dust applied at the rate of 1/4 lb. per tree has given very satisfactory results against Aphis pomi DeG. The applications were made over 40 acres to 8-year-old trees. The dusting should be done on calm nights, a low temperature having little or no effect on the killing power of the nicotine. Applications should be repeated at 7 - 10 day intervals until the foliage is too mature for the aphids to injure it.

WILCOX, J. (2323)

1925. OBSERVATIONS ON SYNETA ALBIDA, LECONTE, IN OREGON AND EXPERIMENTS FOR ITS CONTROL. Jour. Econ. Ent. 18: 686-689, illus. [Abstract in Rev. Appl. Ent. (A) 13: 626. 1925.]

A 4 percent nicotine dust, composed of hydrated lime and nicotine sulphate, applied to beetles on apple twigs in the laboratory, gave complete control in 10 minutes at a temperature of 70° F., but it was less effective in the field.

ANONYMOUS (2324)

1926 ENTOMOLOGICAL INVESTIGATIONS. Wis. Agr. Expt. Sta. Ann. Rept. 1924-1926, Bull. 388, pp. 60-75, illus. [Abstract in Rev. Appl. Ent. (A) 15: 294-295. 1927.]

For combating the black cherry aphid, Myzus cerasi F., a dust made by adding 2 pt. 40-percent nicotine sulphate to 50 lb. hydrated lime stirred in with coarse gravel that was afterwards screened off proved fairly satisfactory, but is probably too expensive for practical use.

BOYD, O. C. (2325)

1926. THE RELATIVE EFFICIENCY OF SOME COPPER DUSTS AND SPRAYS IN THE CONTROL OF POTATO DISEASES AND INSECT PESTS. Cornell Univ. Agr. Expt. Sta. Bull. 451, 68 pp. [Abstract in Rev. Appl. Ent. (A) 15: 182. 1927.]

Copper dust containing nicotine when applied to damp foliage proved superior to the same dust without nicotine in controlling aphids. One dust consisted of 6.5 percent monohydrated copper sulphate; 10 percent calcium arsenate, 1.9 percent nicotine sulphate and 81.6 percent hydrated lime was more effective against aphids than a sulphur dust containing 1.9 percent of nicotine.

CHITTENDEN, F. H., and WHITE, W. H. (2326)

1926. THE MELON APHID AND ITS CONTROL. U. S. Dept. Agr. Farmers' Bull. 1499, 16 pp., illus. [Abstract in Rev. Appl. Ent. (A) 14: 490. 1926.]

A 2 percent nicotine dust at the rate of 35 to 40 lb. an acre, applied at a temperature above 70° F. when the foliage is dry will effectively control Aphis gossypii Glov.

HINDS, W. E. (2327)

1926. PROGRESS IN COTTON BOLL WEEVIL CONTROL. Jour. Econ. Ent. 19: 112-121, illus. [Abstract in Rev. Appl. Ent. (A) 14: 266-267. 1926.]

Over 98 percent of Aphis gossypii Glov. on cotton are destroyed by dusting from an airplane with a mixture of 94 parts by weight of calcium arsenate and 6 parts 40-percent nicotine sulphate applied at the rate of 8 - 9 lb. dust per acre.

MARSHALL, J. (2328)

1926. THE STRIPED CUCUMBER BEETLE, DIABROTICA VITTATA FAB. Ontario Ent. Soc. 56th Ann. Rept., 1925, pp. 80-83. [Abstract in Rev. Appl. Ent. (A) 15: 43-44. 1927.]

Two of the four most successful insecticides were (1) hydrated lime containing 2 percent free nicotine and (2) a dust consisting of 8 percent nicotine sulphate (40-percent), 25 percent anhydrous copper sulphate, and 67 percent hydrated lime.

Free nicotine dust kills more quickly than the dust containing copper sulphate, but the latter remains toxic longer and is a good repellent. Both these dusts give off pungent fumes that make their application difficult.

OGILVIE, L. (2329)

1926. REPORT OF THE PLANT PATHOLOGIST FOR THE YEAR 1935. Bermuda Dept. Agr. Rept. 1925, pp. 36-63. [Abstract in Rev. Appl. Ent. (A) 14: 624-626. 1926.]

Potato tubers attacked by Pseudococcus citri were dusted with nicotine sulphate (2 percent) and sulphur dust in the sun (temperature about 110° F.). This killed about 80 percent. Dusting with 6 percent nicotine sulphate was not effective. Submersion for 2 hours in 40-percent nicotine sulphate (1:400 killed 60 percent of the mealybugs, and the addition of 1/2 oz. fish oil soap per gal. gave very good results.

SPEYER, E. R. (2330)

1926. ENTOMOLOGICAL INVESTIGATIONS. Nursery and Market Gard. Ind. Devlpmt. Soc. Ltd., Expt. andRes. Sta. 11th Ann. Rept., 1926, pp. 89-109. [Abstract in Rev. Appl. Ent. (A) 14: 343-345. 1926.]

Dusting with nicotine up to 3 percent absorbed on calcium carbonate and magnesium carbonate gave no results (p. 345) against the red spider (Tetranychus telarius L.).

THATCHER, R. W. (2331)

1926. FORTY-FOURTH ANNUAL REPORT FOR THE FISCAL YEAR ENDED JUNE 30, 1925. N. Y. (Geneva) Agr. Expt. Sta., 51 pp. [Abstract in Rev. Appl. Ent. (A) 14: 474-475. 1926.]

Nicotine-lime dusts, 2, 3, or 4 percent, were highly toxic to cucumber beetles (Diabrotica vittata F.), provided that temperature was high and direct contact obtained, but caused considerable foliage injury; light applications of dust at lower temperature, while not causing foliage injury, failed to control the beetles. Plants dusted with arsenical dusts gave better yields than those treated with nicotine-lime dusts, apparently mainly on account of the foliage injury and stunting caused by the latter. In tests for the control of thrips and aphids on cauliflowers in seed beds, tobacco dust was superior to nicotine sulphate dust mixture containing 2 percent nicotine or nicotine sulphate spray, 1 pt. to 100 gal. Tobacco dust was more toxic to Myzus persicae Sulz. when diluted with hydrated lime than undiluted. A 2 percent nicotine-lime dust gave good control of thrips and aphids in a field of young cauliflowers.

WATSON, J. R. (2332)

1926. ANOTHER YEAR'S EXPERIENCE WITH CITRUS APHIS. Fla. Hort. Soc. Proc. 39: 159-164. [Abstract in Rev. Appl. Ent. (A) 16: 196-197. 1928.]

Isolated colonies of aphids appearing during winter should be dipped in a bucket containing 40-percent nicotine sulphate, using a tablespoonful and 1 or 2 oz. soap to 1 gal. water; or if they are on larger limbs that cannot be dipped, spot dusting should be done when there is no wind. For heavy infestations, dusting under tents has resulted in an average mortality of 99.5 percent. Dusting with nicotine sulphate and lime on a still day has proved the best treatment for bearing citrus groves in Florida, and as still days are rare during the time of aphid activity a kind of hood has been used which makes dusting possible even in a stiff breeze.

———— (2333)

1926. REPORT OF THE ENTOMOLOGIST. Fla. Agr. Expt. Sta. Rept., 1925-26, pp. 42R-50R. [Abstract in Rev. Appl. Ent. (A) 15: 585-586. 1927.]

In tests against aphids a traveling hood was fitted over a power dusting machine to permit dusting to be done in a wind. This was found to be entirely practical for use with trees up to a height of 20 feet. The most promising insecticide used was finely ground tobacco, which adheres well when applied to wet foliage, and not only kills the aphids on the foliage but acts as a repellent for a few days. This material is very much cheaper than dusts of nicotine sulphate and lime. Control tests against the bean leafhopper (Empoasca fabae Harr.) consists mainly of spraying or dusting the beans, using a hood of some sort that can be moved along the row. Dusting with 3 percent nicotine dust caused 80 to 90 percent of the leafhoppers to fall to the ground, but after a few minutes a great many of them were observed to revive and crawl back. With a 5 percent dust practically all leafhoppers, both nymphs and adults, fell to the ground, and very few of them revived.

YOTHERS, W. W., and MCBRIDE, O. C. (2334)

1926. FACTORS AFFECTING THE CONTROL OF THE GREEN CITRUS APHID WITH NICOTINE DUST. Fla. Hort. Soc. Proc. 1926, 39: 169-171. [Abstract in Rev. Appl. Ent. (A) 16: 197-198. 1928.]

Nicotine sulphate dust with hydrated lime as a carrier having proved of value against Aphis pomi DeG., tests have been made to determine the effect of different weather conditions on its efficiency. In cold, windy weather, very little mortality resulted. The dust cloud surrounded the trees for only about 2 seconds. In cold and calm weather the dust did not drift further than the second row, but the results were disappointing. As wind cannot have been the cause of failure, the low temperature must have been responsible; this bears out the finding of other investigators, namely, that below 60° F. little or no nicotine gas is evolved or liberated. On a warm day (temperature 73 to 75° F.) and in a dead calm. it was observed that the cloud of dust remained for 30 seconds or more round the trees, and very satisfactory results were obtained; 98.1 percent of the aphids being killed. It is considered that much money is probably wasted by carrying out dusting operations while there is any breeze.

ANONYMOUS (2335)

1927. ENTOMOLOGY. Ohio Agr. Expt. Sta. Ann. Rept. 45 (1925-1926). Bull. 402, pp. 49-64, illus. [Abstract in Rev. Appl. Ent. (A) 15: 669-670. 1927.]

Almost perfect control of Aphis rumicis L. on lima beans (Phaseolus lunatus) was effected by one treatment with a 1.6-percent nicotine dust applied with a self-mixing power duster equipped with a canvas drag which covered the rows for 10 feet or more behind the duster.

HIXON, R. M., and DRAKE, C. J. (2336)

1927. CHEMICAL TESTING OF NICOTINE DUSTS. Iowa State Coll. Jour. Sci. 1 (3): 373-377, illus. [Abstract in Expt. Sta. Rec. 57: 655. 1927.]

The authors conclude that the method proposed by Thatcher and Streeter (Expt. Sta. Rec. 49: 551) for chemical testing of the efficiency of various carriers for nicotine dusts is not reliable. An apparatus is described for analyzing the nicotine vapor evolved from a dust, and results are reported on the toxicity of this vapor to the cabbage aphid and rice weevil (Sitophilus oryza L.). The evidence indicates that nicotine decomposition at various rates in the dust is due to oxidation.

JEWETT, H. H. (2337)

1927. THE STRIPED CUCUMBER BEETLE. Ky. Agr. Expt. Sta. Circ. 37, pp. 24-34. [Abstract in Rev. Appl. Ent. (A) 15: 607-608. 1927.]

A dust containing 2 percent free nicotine failed to control the beetles (Diabrotica vittata F.) and one made of 90 percent hydrated lime and 10 percent nicotine sulphate gave very little better result. This was largely due to the weather conditions prevailing in 1926. Nicotine dusts containing 4 to 10 percent nicotine sulphate have been used with good results but should only be applied on clear calm days with a temperature of not less than 65° F. and preferably 70° or higher. The foliage should be dry.

THATCHER, R. W. (2338)

1927. FORTY-FIFTH ANNUAL REPORT FOR THE FISCAL YEAR ENDED JUNE 30, 1926. N. Y. [Geneva] Agr. Expt. Sta. Rept., 69 pp. [Abstract in Rev. Appl. Ent. (A) 15: 150-151. 1927.]

Tests showed that lubricating oil emulsions are not so effective in controlling the rosy aphid (Anuraphis roseus Baker) as lime-sulphur containing nicotine sulphate. Tests by other workers have indicated that the effect of dusts of tobacco and hydrated lime is more rapid under humid conditions, but dusting cauliflower seedlings wet with dew caused injury to the plants. A species of Collembola, a new pest of cabbage seedlings, may be controlled by tobacco dust. The most practical method for destroying striped cucumber beetles (Diabrotica vitatta Say) is to drive them from the main crop by dusting to a trap crop of squash seedlings; the next day they may be killed by means of box fumigators, using a dust of 4 to 5 percent nicotine content and an exposure of 3 to 5 minutes.

WALDRON, M. (2339)

1927. DUSTING OF CITRUS TREES. Fla. Hort. Soc. Proc. 40: 69-72. [Abstract in Rev. Appl. Ent. (A) 16: 199. 1928.]

Spraying with lime-sulphur kills red spider and immature coccids and has the additional advantage that nicotine sulphate can be added to the spray at the rate of 1 qt. to 200 gal. to control aphids more economically than by dusting. Nicotine dust has been successfully used against aphids where there are no air currents, but this condition is almost unknown.

GLENDENNING, R. (2340)

1928. SOME OBSERVATIONS ON NICOTINE DUST. Ontario Ent. Soc. 58th Ann. Rept., 1927, pp. 25-27. [Abstract in Rev. Appl. Ent. (A) 17: 90-91. 1929.]

"The results of applications of nicotine dust depend on the percentage of nicotine in the dust, the condition of the atmosphere, and the length of the exposure of the insect to the fumes; and experiments were carried out with hydrated lime as a carrier for the nicotine, to determine the effect of these factors.

"The strength necessary to kill varied with the insect; for Phyllotreta albionica Lec. (cabbage flea-beetle) a dust containing 3 percent actual nicotine was required to obtain a 90 percent kill, though Phorodon humuli Schr. (hop aphis) was readily destroyed with a 1 percent dust. A 4 percent dust killed almost all the flea-beetles, but was inclined to be too damp and to cake, and was not distributed readily from a hand duster. It would therefore appear that with hydrated lime as a carrier, a 3 percent dust is as high a percentage as is practical and economical. The mortality among flea-beetles with varying strengths of nicotine dust ran in a fairly regular progression, the average percentages killed being 44 for 1 percent dust, 68 for 2 percent and 91 for 3 percent.

"Length of exposure to the fumes appears to be the most important factor in the control of Aphids. In dusting for P. humuli, slight air movements could be largely overcome by extra heavy applications, but this very greatly increases the cost. In the case of Phyllotreta albionica, the air movement seemed to be of less importance, flea beetles being apparently peculiarly susceptible to nicotine fumes. It was found that exposure for 15 seconds at least is necessary to kill Phorodon humuli, while Phyllotreta albionica and the hop flea-beetle (Psylliodes punctulata Mels.) are killed after an exposure of 3 seconds, the different results being probably due to the varying rates of respiration; flea-beetles lose all power of movement after 15 seconds, while the hop aphis often remains alive from 12 to 24 hours after dusting. Variations in temperature are only of importance when hand operated machines or power machines without agitators are used; with these machines a minimum shade temperature of 70° F. was necessary for an effective kill, but otherwise, owing probably to the fact that the agitators raise the temperature of the dust to about 130° F., a 100 percent mortality of P. humuli was obtained at an air temperature of 50° F. During the course of these experiments dusting was found to be as effective on dry as on damp days, taking the temperature into consideration; the addition of 6 percent moisture to the dusts did not produce a markedly different result.

"Though dusts can be applied at a rather lower cost than sprays, it is unlikely that dusting will supplant spraying in British Columbia, owing to the limited period during which the atmospheric conditions are favorable. Nicotine dust will, however, continue to be used on hops, especially if outbreaks of red spider (Tetranychus telarius L.) occur, as a combination dust of ground sulphur, hydrated lime, and nicotine sulphate has been found most effective in destroying both mites and aphids at one operation. It has also proved to provide the only satisfactory method of controlling P. albionica."

HULL, F. M. (2341)

1929. THE PLANT LOUSE PROBLEM OF THE TEXAS GULF COAST. Jour. Econ. Ent. 22: 774-777. [Abstract in Rev. Appl. Ent. (A) 18: 65. 1930.]

Low temperatures and high winds render ineffective standard control measures against various aphids including Aphis pseudobrassicae Davis and Pemphigus populitransversus Riley which seriously damage crucifers. A method of heating nicotine sprays and dusts by means of a small petrol heater attached to the spray tank or dust gun appears to offer promising results in localities with cool temperatures in the growing season.

LYLE, C. (2342)

1929. CONTROLLING PLANT LICE. Miss. State Plant Bd. Quart. Bull. 9 (2): 4 - 8. [Abstract in Rev. Appl. Ent. (A) 18: 277. 1930.]

Directions are given regarding the methods for controlling aphids on turnips, cotton, and pecans by spraying or dusting with nicotine sulphate, and a home-made mixer for making the dust is described.

THOMPSON, B. G. (2343)

1929. NOTE ON THE OCCURRENCE OF THE DUSKY-VEINED WALNUT APHIS, CALLIPTERUS JUGLANDIS FRISCH (A EUROPEAN INSECT) IN AMERICA. Jour. Econ. Ent. 22: 270. [Abstract in Rev. Appl. Ent. (A) 17: 385. 1929.]

Applications of a 2 percent nicotine dust, made after midnight and before 8:00 A.M. and begun when apterous forms predominated, gave excellent control.

WEBSTER, R. L., and BAKER, W. W. (2344)

1929. POTATO FLEA-BEETLES IN WASHINGTON EPITRIX SUBCRINITA LECONTE: E. CUCUMERIS HARRIS. Jour. Econ. Ent. 22: 897-900. [Abstract in Rev. Appl. Ent. (A) 18: 204. 1930.]

Dusting potato foliage has reduced leaf injury, but has not controlled damage to tubers. The most satisfactory dust was a combination of 6 3/4 lb. hydrated lime, 5 lb. finely ground sulphur, and 10 oz. nicotine sulphate, representing an actual nicotine content of 2 percent, but the cost is very high.

HUCKETT, H. C. (2345)

1930. RESULTS FROM THE USE OF NICOTINE IN THE CONTROL OF SUCKING INSECTS ON POTATOES ON LONG ISLAND. Jour. Econ. Ent. 23: 169-174. [Abstract in Rev. Appl. Ent. (A) 18: 400-401. 1930.]

Nicotine dust (3 pt. 40-percent nicotine sulphate, 10 lb. dolomite, and 50 lb. hydrated lime) at the rate of 50 lb. per acre gave better results than nicotine spray (1 pt. 40-percent nicotine sulphate to 100 gal. bordeaux mixture). Insects were Macrosiphum gei Koch, (Illinoia solanifolii Ashm.), Myzus persicae, and Empoasca fabae Harr.

GOFF, C. C., and TISSOT, A. N. (2346)

1932. THE MELON APHID, APHIS GOSSYPII GLOVER. Fla. Agr. Expt. Sta. Bull. 252, 23 pp., illus. [Abstract in Rev. Appl. Ent. (A) 21: 42-43. 1933.]

Control may be effected by nicotine sulphate dust or a spray containing nicotine. Owing to the roughness of the ground and the difficulty of transporting water, dusting seems more practical on wat rmelons. Instructions are given to growers for making their own dust, thus effecting considerable reduction in the cost. A 3 percent dust, which is commonly used, requires 7.5 lb. 40-percent nicotine sulphate to 92.5 lb. lime or 6 lb. 50-percent free nicotine to 94 lb. lime. A 2 percent dust made with 50-percent free nicotine, however, is equivalent in effectiveness to a 3 percent dust made with 40-percent nicotine sulphate, and it is therefore cheaper to make the dust with free nicotine.

SIMPSON, G. W. (2347)

1932. SPRAYING AND DUSTING EXPERIMENTS FOR THE CONTROL OF POTATO APHIDS Jour. Econ. Ent. 25 (3): 634-639. [Abstract in Rev. Appl. Ent. (A) 20: 522. 1932.]

A series of tests was conducted to determine the relative toxicit of various mixtures containing nicotine sulphate and the mechanical efficiency of spraying and dusting practices against aphids on potatoes. Dusting with a canvas trailer was more effective than spraying. Sprays containing potash fish-oil soap were consistently more satisfactory than any others tested. Penetrol and nicotine together gave better results than when added to bordeaux mixture.

3. Homoptera, 1921-1934

a. Aphids, 1921-1934

CORY, E. N. (2348)

1923. DUSTING FOR THE PEA APHIS. Jour. Econ. Ent. 16: 81-84. [Abstrac in Rev. Appl. Ent. (A) 11: 226. 1923.]

Of all the materials tested for the control of the pea aphid (*Acyrthsiphon pisi* Kalt.) only nicotine can be relied upon to give satis factory results. High nicotine content is preferable to low content and not less than 30 lb. of nicotine dust should be used to the acre. Dustin should be done in calm weather, good results being obtained at temperatu above 70° F. The maximum effect may be obtained by the use of a trailer canvas.

RANKIN, W. H. (2349)

1927. MOSAIC OF RASPBERRIES. N. Y. (Geneva) Agr. Expt. Sta. Bull. 543, 60 pp., illus. [Abstract in Rev. Appl. Ent. (A) 15: 598-600. 1927.]

Tests with insecticides against aphids (*Amphorophora rubi*) indicated that a spray consisting of 8 lb. fish-oil soap, 1 pt. nicotine sulphate and 100 gal. water was more effective than a dust containing 2 percent nicotine sulphate, but the aphid population was not materially reduced very long by either material. In other tests, 2 and 3 percent nicotine dusts practically eliminated *A. rubiphila*, but had little lasti effect on *A. rubi*; and sprays of 1 or 2 percent white neutral oil emulsified in water with casein-lime failed to kill all the adults of *A. rubi*.

PARROTT, P. J., and GLASGOW, H. (2350)

1925. THE EFFICIENCY OF VARIOUS SPRAY AND DUST MIXTURES IN CONTROLLING THE ROSY APHIS. Jour. Econ. Ent. 18: 214-218. [Abstract in Rev. Appl. Ent. 13: 255-256. 1925.]

Lime sulphur (1 to 8, 10, or 15 parts of water) plus nicotine sulphate (3/4 to 1 pt. per 100 gal.) was by far the most consistently effective treatment against *Anuraphis roseus*. The delayed dormant period, that is when the tips of the leaves of the more advanced blossom buds are projecting as much as 1/4 or 1/2 inch, is the proper time to apply remedies for this aphid. In the calyx stage even the most effective sprays containing nicotine, thoroughly applied, have practically no effect. Where dust mixtures containing high percentages of nicotine sulphate were used the delayed dormant applications have never given successful results, but if treatment is delayed until the pink of the blossoms just begins to show, a great reduction in the injury by *A. roseus* is obtained.

PARROTT, P. J. (2351)

1928. THE APPLE APHIDS IN RELATION TO PROFITABLE SPRAY PRACTICES. N. Y. State Hort. Soc., Proc. 73rd Ann. Meeting, pp. 6-14. [Abstract in Rev. Appl.Ent. (A) 16: 459-460. 1928.]

The most satisfactory spray for the delayed dormant treatment of apple orchards in western New York is 2 1/2 gal. lime-sulphur, 1 pt. nicotine sulphate (40-percent), 2 1/2 lb. lead arsenate, and 100 gal. water. The preferred sprays for midsummer application are soap and nicotine sulphate, or lime sulphur at summer strength with nicotine sulphate in the usual proportions. The dust recommended is 3 percent nicotine and hydrated lime. The three aphids attacking apple foliage and fruit in New York are *Anuraphis roseus* Baker (rosy apple aphid), *Aphis pomi* DeG. (green apple aphid), and *Rhopalosiphum prunifoliae* Fitch (apple-grain aphid).

PATCH, E. M. (2352)

1924. THE BUCKTHORN APHID (*APHIS ABBREVIATA* PATCH). Maine Agr. Expt. Sta. Bull. 317, pp. 29-52, illus. [Abstract in Rev. Appl. Ent. (A) 13: 31-32. 1925.]

For spraying, kerosene emulsion or nicotine sulphate is recommended or a nicotine dust may be used. Fumigation should be even more effective.

HINDS, W. E. (2353)

1926. REPORT ON THE PRODUCTION OF COTTON IN THE CANETE VALLEY, PERU. Lima Soc. Nac. Agr., 20 pp. [In Spanish. Abstract in Rev. Appl. Ent. (A) 17: 23-24. 1929.]

A dust of 1 lb. 40 percent nicotine sulphate and 16 lb. calcium arsenate or slacked lime is effective against Aphis gossypii Glov.

OGILVIE, L. (2354)

1926. SEASONABLE NOTES ON PLANT DISEASES AND PESTS. Bermuda Dept. Agr. Agr. Bull. 5 (5): 3-4. [Abstract in Rev. Appl. Ent. (A) 14: 468. 1926.]

Peregrinus maidis on maize can be controlled by several applications of nicotine dust during the heat of the day. Melons infested with Aphis gossypii should be dusted with nicotine dust or sprayed with nicotine sulphate (40-percent) at 1 to 800 plus a little soap during the heat of the day. Nicotine dust may also be used to control Trialeurodes (Dialeurodes) vaporariorum (whitefly) on these plants.

TOWNSEND, C. H. T. (2355)

1927. THE WHITE SCALE (PINNASPIS MINOR). CUTWORMS AND THEIR CONTROL. THE SUGARY SECRETION OF APHIS GOSSYPII ON COTTON. Estac. Expt. Agr. Soc. Nac. Agr., Circ. No. 1, 4pp.; No. 3, 4pp., illus.; No. 4, 3 pp. [Lima]. [In Spanish. Abstract in Rev. Appl. Ent. (A) 16: 251. 1928.]

Aphis gossypii Glov. is easily controlled by sprays or dusts containing nicotine, and a dust made by mixing 2 lb. liquid nicotine sulphate (40-percent) with 42 lb. calcium arsenate is effective against the aphid, leaf-eating caterpillars, etc.

HAMMER, A. L. (2356)

1928. PREDICTING SERIOUS COTTON APHIS INFESTATIONS. Jour. Econ. Ent. 21: 736-741 [Abstract in Rev. Appl. Ent. (A) 17: 77. 1929.]

No satisfactory results against the cotton aphid (Aphis gossypii Glov.) were obtained from the application of 7.5 percent nicotine sulphate dusts.

OGILVIE, L. (2357)

1928. REPORT OF THE PLANT PATHOLOGIST FOR THE YEAR 1927. Bermuda Dept. Agr. Rept. 1927, pp. 26-37. [Abstract in Rev. Appl. Ent. (A) 16: 683-684. 1928.]

Dusting with nicotine in the early morning gave good results against sminthurids on cabbage. Aphis gossypii Glov. attacking hibiscus in hedges was checked by spraying with 40-percent nicotine sulphate(1:800). A. (?) sinensis Delg. on lilies is easily controlled by dusting with nicotine or spraying with nicotine sulphate.

________ (2358)

1928. A TRANSMISSIBLE VIRUS DISEASE OF THE EASTER LILY. Ann. Appl. Biol. 15 (4): 540-562. [Abstract in Rev. Appl. Ent. (A) 17: 615. 1929.]

Aphis gossypii Glov. is known to transmit the virus disease "yellow flat" of the Easter lily. Plants should be dusted during dry sunny weather with nicotine or sprayed with 40-percent nicotine sulphate, at a dilution of about 3/4 pt. to 100 gal. with the addition of 3 - 5 lb. soap, or this solution without soap in combination with boredaux mixture.

COAD, B. R., FOLSOM, J. W., and GAINES, R. C. (2359)

1929. COTTON LOUSE CONTROL. U. S. Dept. Agr. Leaflet 53, 4 pp., illus. [Abstract in Rev. Appl. Ent. (A) 17: 718. 1929.]

Aphis gossypii Glov. on cotton is controlled by dusting with nicotine sulphate. A home-made ball mill for mixing the dust is described.

PLOTNIKOV, V. (2360)

1929. CONTRIBUTION TO THE QUESTION OF THE CONTROL OF THE CHIEF PESTS OF COTTON. Khlopkovoe Delo 8 (5-6): 579-584. [In Russian. Abstract in Rev. Appl. Ent. (A) 17: 631. 1929.]

In order to prevent the migration of Aphis gossypii from cucurbits to cotton in autumn the former should be sprayed with soap solution or nicotine and soap, or preferably dusted with nicotine and freshly slaked lime.

FOLSOM, J. W., and BONDY, F. F. (2361)

1930. CALCIUM ARSENATE DUSTING AS A CAUSE OF APHID INFESTATION. U. S. Dept. Agr. Circ. 116, 12 pp.

On plot 3 one application of nicotine mixture (lime base with 2.62 percent nicotine, about 10 lb. per acre) wiped out the infestation of the cotton aphid (Aphis gossypii Glov.). The same kind of nicotine treatment also destroyed the aphids on plot 4.

NOVITZKII (2362)

1930. ON THE AUTUMN SPRAYING OF COTTON AGAINST THE COTTON APHIS. Khlopkovoe Delo 9 (7-8): 890-893. [Tashkent]. [In Russian. Abstract in Rev. Appl. Ent. (A) 19: 306-307. 1931.]

Soap spray (3 to 4 lb. soap to 12 gal. water is very effective) should be applied before the bolls have opened, and attention should be given to the possibility of controlling the aphid (Aphis gossypii Glov.) by nicotine dusts.

TZUIGANKOV, S. K. (2363)

1930. SOOTY MOULD OF COTTON AND ITS CONTROL. Khlopkovoe Delo 9 (9): 1070-1078, illus. [Tashkent.] [In Russian. Abstract in Rev. Appl. Ent. (A) 19: 160. 1931.]

Sprays of 4 percent soap or tobacco extract (1 to 3,000) and a nicotine dust combined with flowers of sulphur were applied in fields, against aphids (*Aphis gossypii* Glov.) on cotton. Complete mortality was not obtained, though infestation of the leaves described on an average by about 50 percent. If A. *gossypii* and the mite *Tetranychus telarius* L. occur together, preference should be given to soap solution or the nicotine dust combined with flowers of sulphur.

NOVITZKII, V. (2364)

1931. AN EXPERIMENT IN THE APPLICATION OF NICODUST AGAINST THE AUTUMN GENERATIONS OF THE COTTON APHIS. Za Khlopkov. Nezavisim, No. 4, pp. 52-54. [In Russian. Abstract in Rev. Appl. Ent. (A) 21: 52-53. 1933.]

Field tests were carried out with a dust containing 1.68 percent nicotine with lime as a carrier. Applied with a hand duster at the rate of about 40 lb. to the acre, it killed on an average 90.7 percent of the aphids (*Aphis gossypii* Glov.) without injury to the plants.

GOLOVIZNIN, D., ET AL. (2365)

1932. THE CONTROL OF PESTS OF COTTON. [AVIATION IN CONTROL OF AGRICULTURAL AND FOREST PESTS.] Mater. 1st. All-Union Avio-Chem. Conf. Moscow 1930, pp. 158-173. Sel' Kolkhozgiz [Agr. Co-op. Pub.], 1932. [In Russian. Abstract in Rev. Appl. Ent. (A) 20: 390-391. 1932.]

It was found that airplanes could be used for dusting with flowers of sulphur against *Tetranychus telarius* L. and nicotine against aphids.

PIERSTORFF, A. L. (2366)

1925. CONTROL OF APHIDS ON NURSERY STOCK. Jour. Econ. Ent. 18: 227-230. [Abstract in Rev. Appl. Ent. (A) 13: 257. 1925.]

A lime-nicotine dust mixture (nicotine = 2.7 percent) was found to be the best remedy for the aphids *Aphis pomi* DeG. and *A. sorbi* Kalt., two or three applications sometimes proving necessary for the control of *A. pomi*. All the applications were made with hand blowers. One application of the dust proved sufficient to check the numbers of *Myzus cerasi* on sweet cherry stock.

WATSON, J. R. (2367)

1925. ANOTHER YEAR OF THE CITRUS APHIS. Fla. Ent. (1 and 2): 9-13, 26-28. [Abstract in Rev. Appl. Ent. (A) 14: 44-45. 1926.]

The most satisfactory measures against *Aphis pomi* DeG. under all weather conditions are dipping the branches of small citrus trees in a bucket, and fumigation under tents. For dipping, a solution of derris-oil, or 1 tablespoonful of nicotine sulphate and 1 ounce of soap, per gallon is used. For fumigation, calcium cyanide dust, or a 3 percent nicotine sulphate and lime dust, is used. These dusts also kill rust mites (*Phyllocoptes oleivorus* Ash.) and coccid larvae, but red spiders require a longer exposure than 5 minutes. Oil emulsions, lime-sulphur, and soap sprays are satisfactory for aphids before the leaves are curled, and their efficacy is increased by the addition of nicotine sulphate.

MILLER, R. L. (2368)

1926. SNUFF AS AN INSECTICIDE. Fla. Hort. Soc. Proc. 1926. 39: 165-168. [Abstract in Rev. Appl. Ent. (A) 16: 197. 1928.]

Dry snuff (nicotine = 2.05 percent) was ineffective but 2 parts snuff + 1 part finely ground anhydrous calcium chloride caused 96 percent mortality of the citrus aphid Aphis pomi DeG. A spray of 11 lb. snuff in 50 gal. water killed 95 percent of the aphids within 24 hours. When the foliage was wet with dew snuff caused 99 percent mortality. The same kill was given by a lime-nicotine sulphate dust.

WALDEN, B. H. (2369)

1923. NICOTINE DUST AS A CONTROL FOR THE TURNIP APHID. Conn. Agr. Expt. Sta. Bull. 247, pp. 346-347. [Abstract in Rev. Appl. Ent. (A) 11: 557. 1923.]

Swedish turnips that were heavily infested with Aphis pseudobrassicae Davis were effectively dusted with a sulphur nicotine dust containing 5 percent nicotine sulphate, equivalent to 2 percent of nicotine.

CAESAR, L. (2370)

1927. AN OUTBREAK OF THE TURNIP APHID, APHIS PSEUDOBRASSICAE DAVIS. Ontario Ent. Soc. 57th Ann. Rept. 1926, pp. 41-43. [Abstract in Rev. Appl. Ent. (A) 15: 666-667. 1927.]

It is believed that dusting is the only method that will prove effective on a large scale. A dust of 5 lb. 40-percent nicotine sulphate and 95 lb. hydrated lime killed almost all the aphids when applied on both sides of the row.

MORRIS, H. M. (2371)

1931. ANNUAL REPORT OF THE ENTOMOLOGIST FOR 1930. Cyprus Dept. Agr. Ann. Rept. 1930, pp. 48-55. [Abstract in Rev. Appl. Ent. (A) 20: 101. 1932.]

Nicotine sulphate, used either as a dust or a spray, gave satisfactory results against Aphis rumicis L., which had caused considerable injury to beans early in the season in Cyprus.

WATSON, J. R., and BEYER, A. H. (2372)

1925. CONTROLLING THE CITRUS APHIS (APHIS SPIRAECOIA PATCH). Fla. Agr. Expt. Sta. Bull. 174, pp. 81-96, illus. [Abstract in Rev. Appl. Ent. (A) 13: 324-325. 1925.]

A 3 percent nicotine sulphate-lime dust is recommended. Infested twigs on young trees may be dipped in a bucket of nicotine sulphate solution, (1 tablespoonful of nicotine sulphate and a few tablespoonfuls of soap to a bucket of water) and infested twigs that cannot be bent over should be cut off and dropped into the insecticide or washed with a sponge.

MILLER, R. L. (2373)

1929. A CONTRIBUTION TO THE BIOLOGY AND CONTROL OF THE GREEN CITRUS APHID, *APHIS SPIRAECOLA* PATCH. Fla. Agr. Expt. Sta. Bull. 203, pp. 431-476, illus. [Abstract in Rev. Appl. Ent. (A) 18: 371-372. 1930.]

Nicotine sulphate (1:800) with 1/2 to 1 percent soap solution gave 99 percent mortality. A dust of 7 1/2 lb. nicotine sulphate to 100 lb. lime (3 percent dust) killed 99.8 percent.

GAMBRELL, F. L. (2374)

1932. STUDIES OF SOME INSECTS OF EVERGREENS. Nat. Shade Tree Conf., Proc. pp. 89-93. [Abstract in Rev. Appl. Ent. (A) 21: 316-317. 1933.]

Satisfactory results against the spruce gall aphid, (*Chermes* (*Adelges*) *abietis* L.), and Sitka gall aphid (C. (*Gillettea*) *cooleyi* Gill.), may be obtained with a single application of 1 pt. nicotine sulphate and 5 lb. soap to 100 gal. water. The nicotine spray is most effective at 50° F. or over. An application during late autumn or early spring of a 2 percent nicotine-lime dust apparently afforded good protection against *C. abietis*.

FRIEND, R. B., and WALDEN, B. H. (2375)

1925. EXPERIENCES IN DUSTING TO KILL PEA APHID, CABBAGE APHID AND ONION THRIPS. Conn. Agr. Expt. Sta. Bull. 265, pp. 319-320. [Abstract in Rev. Appl. Ent. (A) 13: 415-416. 1925.]

Nicotine dust (3 percent) applied at the rate of 50 lb. per acre between 7:00 a.m. and 1:00 p.m. almost entirely eliminated *Brevicoryne brassicae* L. Nicotine dust (2.75 percent) at the rate of 140 lb. per acre killed 89 percent of *Illinoia pisi* Kalt, but a heavy application of this dust showed little control of *Thrips tabaci* on onions.

PATCH, E. M. (2376)

1927. THE PEA APHID IN MAINE. Maine Agr. Expt. Sta. Bull. 337, pp. 9-20, illus. [Abstract in Rev. Appl. Ent. (A) 15: 394-395. 1927.]

For the control of *Illinoia pisi* Kalt. on peas a dust containing 3 percent nicotine with hydrated lime as the carrier has proved satisfactory though other carriers such as sulphur or gypsum have given good results.

GRISWOLD, G. H. (2377)

1927. OBSERVATIONS ON THE BIOLOGY OF A NEW GERANIUM APHID (*MACROSIPHUM CORNELLI* PATCH.) Jour. Econ. Ent. 20: 91-94. [Abstract in Rev. Appl. Ent. (A) 15: 254-255. 1927.]

A 2 percent free nicotine dust kills 90 to 100 percent of the aphids. A spray of 1 teaspoonful nicotine sulphate and 1 oz. soap to 1 gal. may be used, or the plants may be dipped in this.

DUDLEY, J. E., JR., SEARLS, E. M., and WEED, A. (2378)

1929. PEA APHID INVESTIGATIONS. Trans. 4th Internat. Cong. Ent. Ithaca, N. Y. II: 608-621, illus. [Abstract in Rev. Appl. Ent. (A) 18: 314-315. 1930.]

The most uniform results against the pea aphid (*Macrosiphum (Illinoia) pisi* Kalt) were obtained with a dust containing 8 lb. nicotine sulphate, 16 lb. monohydrated copper sulphate and 76 lb. lime. The effectiveness of dusting, however, was found to be more dependent on weather conditions at the time of and following treatment than on the strength of material or amount per acre.

SMITH, R. C. (2379)

1932. THE CONTROL OF THE PEA APHID IN ALFALFA FIELDS WITH SPECIAL REFERENCE TO THE CHAIN DRAG. Jour. Econ. Ent. 25 (2): 157-164, illus. [Abstract in Rev. Appl. Ent. (A) 20: 409-410. 1932.]

Nicotine sulphate sprays and dusts failed to give satisfactory control of this aphid (*Macrosiphum* (*Illinoia*) *pisi* Kalt.)

KISLANKO, J. P. (2380)

1930. THE BLACK PECAN APHID (*MYZOCALLIS FUMIPENNELLUS* FITCH). Miss. State Plant Bd. Quart. Bull. 9 (4): 7-10.

This aphid can be controlled with a 2 percent home-made nicotine dust, if the dusting is done at the time the aphids appear and the entire orchard is dusted.

Other aphids (*Monellia costalis* and *M. caryae*) were also killed, besides the following: 8 coleopterous adults, 16 dipterous adults, 8 leafhoppers, 2 Ephemeridae, 4 small moths, 4 hymenopterous adults, and 3 small spiders.

PLAKIDAS, A. G. (2381)

1927. STRAWBERRY XANTHOSIS (YELLOWS) A NEW INSECT-BORNE DISEASE. Jour. Agr. Res. 35 (12): 1057-1090, illus. [Abstract in Rev. Appl. Ent. (A) 16: 438-439. 1928.]

The strawberry aphid (*Myzus fragaefolii* Ckll.) which transmits this disease from diseased to healthy plants is very readily killed by spraying or dusting with nicotine.

STANILAND, L. N., and BEAUMONT, A. (2382)

1933. NINTH ANNUAL REPORT OF THE DEPARTMENT OF PLANT PATHOLOGY FOR THE YEAR ENDING SEPTEMBER 30th, 1932. Pamphlet Seale-Hayne Agr. Coll., No. 40, 43 pp., illus. [Abstract in Rev. Appl. Ent. (A) 21: 559-560. 1933.]

Plants infested with aphids (*Myzus ornatus* Laing) should receive two applications of nicotine, either in the form of a spray (6 oz. to 100 gal. water with soap), or under very favorable weather conditions, of a dust.

WALTON, C. L. (2383)

1923. THE CONTROL OF APHIDS ATTACKING SPROUTING POTATOES. Jour. Min. Agr. 30 (9): 829-833 [London]. [Abstract in Rev. Appl. Ent. (A) 12: 39. 1924.]

Potato tubers heavily infested with aphids (*Myzus persicae* Sulz.) were fumigated with p-dichlorobenzene, tetrachlorethane, and others were treated with a dust containing 5 percent nicotine sulphate, equivalent to 2 percent pure nicotine. They were then planted and examined about 8 weeks afterward. The first two lots were markedly backward, while the lot treated with nicotine sulphate and the untreated lot were for the most part strong and vigorous. It might appear that although nicotine sulphate effectively killed the aphids, the crop from the treated tubers was no better than from the untreated ones. The nicotine sulphate treatment would prove most effective on potatoes sprouted in boxes, etc., in single layers, as they are then freely exposed to the dust and a considerable quantity can be dealt with rapidly and effectively.

SPENCER, H., ZIMMERLEY, H. H., and DAVIS, R. J. (2384)

1924. DUSTING AND SPRAYING EGGPLANTS. Va. Truck Expt. Sta. Bull. 47, pp. 331-347, illus. [Abstract in Rev. Appl. Ent. (A) 13: 32-33. 1925.]

Aphids (*Myzus persicae* Sulz. and *Macrosiphum solanifolii* Ash.) were controlled by dusting with 3 percent nicotine dust while the plants were in hotbeads.

HUCKETT, H. C. (2385)

1925. THE CONTROL OF APHIDS WHICH INFEST CAULIFLOWER SEED BEDS ON LONG ISLAND BY MEANS OF TOBACCO DUST MIXTURES. Jour. Econ. Ent. 18: 128-132. [Abstract in Rev. Appl. Ent. (A) 13: 246-247. 1925.]

Nicotine sulphate spray (1:800) is effective against *Myzus persicae* Sulz. and *Macrosiphum solanifolii* Ashm. in cauliflower seed beds. The use of pure superfine tobacco dust (1 percent mixture) gave better yields of plants than nicotine sulphate-hydrated lime dust (.8 percent nicotine) or nicotine sulphate spray (1:800). The mixture which gave the highest average killing effect was tobacco dust 85 pounds and hydrated lime 15 pounds. This was better than pure tobacco dust.

ZECK, E. H. (2386)

1928. THE GREEN PEACH APHID, *MYZUS PERSICAE* (SUIZER). Agr. Gaz. N. S. Wales 39 (2): 147-154, illus. [Abstract in Rev. Appl. Ent. (A) 16: 362-363. 1928.]

Tobacco or nicotine washes will kill the aphids if the leaves are not too curled. A tobacco wash of 25 lb. stalk or waste tobacco to 72 gal. water, or 1 pt. nicotine sulphate to 100 gal. water, or a nicotine dust may be used.

HERNANDEZ, E. (2387)

1925. THE CONTROL OF THE YELLOW SUGAR-CANE APHIS. Rev. Agr. Puerto Rico 14 (6): 358-360. [In Spanish. Abstract in Rev. Appl. Ent. (A) 13: 435. 1925.]

The yellow sugarcane aphid (*Sipha flava*) can be controlled by dusting the canes with nicotine sulphate, which has been found to destroy from 85 percent upwards of the aphids.

DOZIER, H. L. (2388)

1926. ANNUAL REPORT OF THE DIVISION OF ENTOMOLOGY. Ann. Rept. Insular Expt. Sta. Rio Piedras, Porto Rico 1924-25, pp. 115-124. [Abstract in Rev. Appl. Ent. (A) 15: 152-153. 1927.]

In one locality the yellow sugarcane aphid (*Sipha flava* Forbes) was successfully controlled by 3 percent nicotine dust.

BATCHELOR, L. D. (2389)

1921. WALNUT CULTURE IN CALIFORNIA. Calif. Agr. Expt. Sta. Bull. 332, pp. 141-218. [Abstract in Rev. Appl. Ent. (A) 10: 286. 1922.]

By the addition of 1 pt. Black Leaf 40 to each 200 gal. of arsenate the spray (used to control codling moth) will also be effective against aphids. For the control of aphids alone nicodust is advocated.

WILLIAMS, C. G. (2390)

1922. 41ST ANNUAL REPORT OF THE OHIO AGRICULTURAL EXPERIMENT STATION FOR THE YEAR ENDED JUNE 30, 1922, 59 pp., illus. [Abstract in Rev. Appl. Ent. (A) 11: 519. 1923.]

Experiments with a preparation of derris (1 to 1,200) show it to be less effective than nicotine sulphate (1 teaspoonful to 1 gal. soapy water) for the control of aphids. Nicotine as a dust proved more effective than spraying with liquids against aphids on apple.

PARROTT, P. J., STEWARD, F. C., and GLASGOW, H. (2391)

1923. SPRAYING AND DUSTING EXPERIMENTS WITH APPLES IN 1923. N. Y. Agr. Expt. Sta. Circ. 70, 9 pp. [Abstract in Rev. Appl. Ent. (A) 13: 81. 1925.]

Experiments continued on the same lines as in the previous year [Rev. Appl. Ent. (A) 11: 358] indicate the effectiveness of nicotine dus (sulphur-lead arsenate 90:10 with 2 percent nicotine) on apples in the early pink stage for the control of aphids.

SANDERS, G. E. (2392)

1923. DUSTING VERSUS SPRAYING. Quebec Soc. Protect. Plants 15th Ann. R 1922-1923, pp. 34-39. [Abstract in Rev. Appl. Ent. (A) 11: 476. 1923.

The employment of nicotine as a dust has progressed to such an extent that it gives much more satisfactory control of sucking insects, apart from coccids, than spraying. The most successful nicotine dust consisted of a total of 6 percent of nicotine sulphate. These dusts were effective against the pea aphid, potato aphid, and pear psylla.

ANONYMOUS (2393)

1924. CONTROL OF APHIDS ON CITRUS. Citrus Indus. 5 (5): 22.

In Florida it is recommended that citrus trees bearing aphids be dusted. All things considered, the most satisfactory control measure was found to be a thorough dusting with a 3 percent nicotine sulphate lime dust. If not equipped for dusting, a thorough spraying with 40-percent nicotine sulphate, at least 1 to 800, with some spreader added may be applied to advantage.

BEYER, A. H. (2394)

1924. LIFE HISTORY OF THE NEW CITRUS APHIS. Fla. Ent. 8 (1): 8-13. [Abstract in Rev. Appl. Ent. (A) 12: 446. 1924.]

Nicotine dusts do not scorch the tender foliage of 4-year old citrus trees as does calcium cyanid; and are also less destructive to the natural enemies of this unidentified aphid.

PARROTT, P. J. (2395)

1925. SOME PRACTICAL POINTS RELATIVE TO CONTROL OF ROSY APHIS. N. Y. State Hort. Soc. 70th Ann. Meeting, pp. 17-22. [Abstract in Rev. Appl. Ent. (A) 14: 73. 1926.]

The most effective spray for the control of the rosy aphid on appl is lime-sulphur 1 to 8 plus nicotine sulphate (4 percent) 1 to 800. This is also effective against San Jose Scale and scab but if lepidoptero larvae are present 3 lb. powdered lead arsenate should be added. Dusts are less satisfactory but if preferred they should contain not less than 2 percent nicotine.

ZAPPE, M. P., and STODDARD, E. M. (2396)

1925. DUSTING VERSUS SPRAYING. SEASON OF 1924. Conn. Agr. Expt. Sta. Bull. 265, pp. 286-292. [Abstract in Rev. Appl. Ent. (A) 13: 413. 1925.]

The addition of nicotine to the lead-arsenate and lime-sulphur spray gave good control of leafhoppers, but one application of nicotine dust gave in most cases better control of aphids than three of nicotine spray.

OGILVIE, L. (2397)

1927. SOME BERMUDA APHIDES AND THEIR CONTROL. Bermuda Dept. Agr., Agr. Bull. 6 (5): 5-7. [Abstract in Rev. Appl. Ent. (A) 15: 525-526. 1927.]

On ornamental plants nicotine dust or nicotine sulphate sprays may be used for the control of aphids.

SANBORN, C. E., BROWN, W. J., and BIEBERDORF, G. A. (2398)

1927. ENTOMOLOGY. Bien. Rept. Okla. Agr. Expt. Sta. 1924-1926, pp. 38-4 [Abstract in Rev. Appl. Ent. (A) 15: 591-592. 1927.]

Dusting with a mixture of 2 to 3 pt. nicotine sulphate and 50 lb. hydrated lime was an effective measure against aphids on cucurbits. Nicotine dust was also recommended against other aphids.

WALLACE, H. F. (2399)

1929. BOLL WEEVIL AND PLANT LICE POISONING WORK. Miss. Agr. Expt. Sta. Bull. 271, pp. 14-15. [Abstract in Rev. Appl. Ent. (A) 18: 708. 1930.

Two dusts were used, one a mixture of 8 parts calcium arsenate an 1 part of a commercial mixture of nicotine sulphate and calcium arsenate, and the other a mixture of 2 parts calcium arsenate to 1 part tobacco dust. The use of the dust containing nicotine sulphate resulted in an increased yield of 355 lb. per acre over the untreated plots and of that containing tobacco dust 259 lb. Both forms of nicotine controlled aphid infestation.

WATSON, J. R. (2400)

1929. REPORT OF THE DEPARTMENT OF ENTOMOLOGY. Fla. Agr. Expt. Sta. Rept. 1927-28, pp. 42R-49R. [Abstract in Rev. Appl. Ent. (A) 18: 246-247. 1930.]

A proprietary insecticide that is apparently a pyrethrum compound gave much better results than the usual 3 percent nicotine sulphate and lime dust against aphids.

HUCKETT, H. C. (2401)

1931. SPRAYING AND DUSTING EXPERIMENTS WITH POTATOES ON LONG ISLAND. N. Y. (Geneva) Agr. Expt. Sta. Bull. 592, 38 pp., illus. [Abstract in Rev. Appl. Ent. (A) 19: 474-475. 1931.]

Nicotine dust is the only reliable check to aphid infestation, but it is expensive and very uncertain in its effect on the actual yield of crop.

WRIGHT, W. H. (2402)

1933. WALNUT APHIS CONTROL. Calif. Dept. Agr. Monthly Bull. 22 (2-3): 166-169. [Abstract in Rev. Appl. Ent. (A) 21: 595. 1933.]

When the outbreak is slight and there are not more than 6 individuals per leaflet, control may be obtained by the application of a dust of 3 percent nicotine sulphate (Rev. Appl. Ent. (A) 8: 130; 10: 286). Heavily infested trees should be dusted twice at an interval of 2-3 weeks with a 3.5 to 4 percent dust.

RIPPER, W. (2403)

1934. THE CONTROL OF HEAVY INFESTATIONS OF THE BEET LEAF APHIS. Neuheiten Pflanzenschutz. 27 (3): 55-58. [In German. Abstract in Rev. Appl. Ent. (A) 22: 507-508. 1934.]

Complete control was obtained on a small scale by a spray containing 2 percent soft soap and 1 percent spirit, and in large areas by a dust of nicotine sulphate with an inert carrier (1:19) applied at the rate of 124 lb. per acre.

b. Psyllids and Leafhoppers, 1921-1934

KELSALL, A. (2404)

1923. CONTROL OF ORCHARD PESTS. Nova Scotia Fruit Growers Assoc. 59th Ann. Rept. 1923, pp. 95-106. [Abstract in Rev. Appl. Ent. (A) 11: 394-395. 1923.]

Nicotine vapor projected from a dusting machine to control sucking insects has proved promising. Nicotine should be added to the spray if the apple sucker (Psylla mali) is very numerous, and where a dust schedule is being followed a nicotine impregnated dust may be used.

PARROTT, P. J. (2405)

1922. CONTROL OF SUCKING INSECTS BY DUSTING. N. Y. State Hort. Soc. Proc. 67th Ann. Meeting, pp. 35-49. [Abstract in Rev. Appl. Ent. (A) 10: 325. 1922.]

The adult pear psylla (Psylla pyricola) showed a marked susceptibility to nicotine in dust and liquid forms. The effect of nicotine in dust and liquid form on apple redbugs (Lygidea mendax), currant aphid (Myzus ribis), and cabbage aphid (Brevicoryne (Aphis) brassicae) have been described elsewhere (Jour. Econ. Ent. 15: 82-85. 1922.).

STRICKLAND, L. F. (2406)

1922. CO-OPERATIVE EXPERIMENTS WITH LIME-NICOTINE DUST AGAINST HARD SHELL NYMPHS AND ADULTS. N. Y. State Hort. Soc. Proc. 67th Ann. Meeting, pp. 55-65. [Abstract in Rev. Appl. Ent. (A) 10: 326. 1922.]

A heavy lime-nicotine spray should be directed against the first-and second-brood nymphs of the pear psylla (Psylla pyricola), or an application of lime-nicotine dust should be made for the hard shell nymphs and adults of the first or second generation.

HARTZELL, F. Z. (2407)

1924. THE ESTIMATION OF DOSAGE FOR VOLATILE DUSTS: AN ILLUSTRATION OF THE VALUE OF CORRELATION MATHEMATICS TO ENTOMOLOGY. Jour. Econ. Ent. 17 (2): 279-285.

The results presented are based upon experiments for the control of pear psylla in commercial orchards in western New York and the particular dosages apply strictly to 2 percent lime-nicotine dust. The methods of determining dosage were believed to be of general application for volatile dusts on different trees and for various insects (p. 285).

MUNDINGER, F. C. (2408)

1924. EXPERIMENTS WITH CALCIUM CYANIDE AS AN INSECTICIDE. N. Y. State Hort. Soc. Proc. 69th Ann. Meeting, pp. 134-138. [Abstract in Rev. Appl. Ent. (A) 12: 278. 1924.]

Calcium cyanide, one part to three parts of ground talc as a carrier appears to be as effective as a 2 percent nicotine dust for the control of the pear psylla (Psylla pyricola Först.) and the grape leafhopper (Erythroneura comes Say.) and if carefully applied will not injure the pear or grape foliage.

PARROTT, P. J. (2409)

1924. SOME SIDELIGHTS ON DUSTING AND SPRAYING PRACTICES. N. Y. State Hort. Soc. Proc. 69th Ann. Meeting, pp. 118-134. [Abstract in Rev. Appl. Ent. (A) 12: 277. 1924.]

Adult pear psyllas (Psylla pyricola Först.) are susceptible to nicotine dusts. Nicotine dusts are not very satisfactory against the rosy apple aphid (Anuraphis roseus Baker) and if used should be applied when the blossom buds are in the pink stage, as the aphids are most susceptible at this period.

FROST, S. W., and CRAIGHEAD, E.M. (2410)

1924. DUSTING FOR LEAFHOPPERS (EMPOA ROSAE L.) IN BEARING APPLE ORCHARDS. Jour. Econ. Ent. 17: 262-264, illus. [Abstract in Rev. Appl. Ent. (A) 12: 312. 1924.]

A 2 percent nicotine sulphate dust and 1 1/4 or 2 percent free nicotine dust killed a large proportion of the nymphs and adults.

DAVIAULT, L. (2411)

1926. LES CICADELLES ENNEMIS DE NOS PLANTES POTAGÈRES. Sci. Agr. 6 (5): 169-172. [Abstract in Rev. Appl. Ent. (A) 14: 122. 1926.]

Jassids causing a type of leafbrown in Montreal include Cicadul sexnotata Fall.; Helochara communis Fitch; Empoasca fabae Harr. (mali and Parabolocratus viridis Uhler. The best remedy is bordeaux mixture used as a repellent. A dust of precipitated sulphur and nicotine has proved slightly less successful but is useful on plants nearly ready f market as the dust is readily removed by washing with water.

ANONYMOUS (2412)

1927. APHIDS AND JASSIDS ATTACKING COTTON. S. and E. African Agr. Co Proc. 1926, pp. 173-174; 180-181. [Abstract in Rev. Appl. Ent. (A) 15: 564. 1927.]

Nicotine dust if applied at sufficient strength is toxic to the jassid, Empoasca (Chlorita) facialis Jac. but bordeaux mixture either as a dust or spray is the only substance giving lasting results.

HEADLEE, T. J. (2413)

1922. REPORT OF THE DEPARTMENT OF ENTOMOLOGY 1920-21. N. J. Agr. Expt Sta. Rept. 1920-1921, pp. 351-408, illus. [Abstract in Rev. Appl. En (A) 10: 609-610.]

Nicotine impregnated dusts destroy a high percentage of the oat aphid (Siphonaphis padi) and apple leafhopper (Empoasca mali).

RUGGLES, A. G., and EYER, J. R. (2414)

1923. PRELIMINARY NOTES ON THE LIFE-HISTORY AND CONTROL OF THE POTATO LEAF-HOPPER, EMPOASCA MALI, LEB. Minn. State Ent., 19th Rept. 1921-1922, pp. 10-14. [Abstract in Rev. Appl. Ent. (A) 12: 56. 1924.

Bordeaux mixture was not very effective in the dust form either alone or in combination with a nicotine dust.

ANONYMOUS (2415)

1924. ENTOMOLOGY AND PARASITOLOGY. Calif. Agr. Expt. Sta. Rept. 1923-1924, pp. 37-39, 42-43. [Abstract in Rev. Appl. Ent. (A) 13: 498 1925.]

Calcium cyanide dust and nicotine dust have been utilized particularly as a means of killing the adults of the grape leafhopper, Erythroneura comes Say, in early spring.

ROSS, W. A. (2416)

1924. MISCELLANEOUS NOTES ON GRAPE LEAFHOPPER CONTROL. Ontario Ent. Soc. 54th Ann. Rept. (1923), pp. 24-26. [Abstract in Rev. Appl. Ent. (12): 534. 1924.]

Newly-laid eggs of the grape leafhopper (Erythroneura comes) were less susceptible to nicotine than those over 8 days old. Nicotine dust proved unsatisfactory as an ovicide, but the addition of lime apparently increased its effectiveness. Nicotine sulphate (1:1,200) with 5 lb. hydrated lime in 40 gal. destroyed all eggs in all stages of development.

DOZIER, H. L. (2417)

1926. DEPARTMENT OF ENTOMOLOGY. Del. Agr. Expt. Sta. Bull. 147 (Ann Rept. 1925-1926), pp. 17-20. [Abstract in Rev. Appl. Ent. (A) 15: 149-150. 1927.]

Nicotine sprays did not control adult grape leafhoppers (Erythroneura comes Say) very satisfactorily. Calcium cyanide dust was demonstrated to have better killing powers than nicotine-lime dust, but a few growers used 2 percent nicotine lime dust with good results, the cost being about 20 s. an acre.

HAMILTON, C. C., and GEMMELL, L. G. (2418)

1934. SOME FIELD TESTS SHOWING THE COMPARATIVE EFFICIENCY OF DERRIS, PYRETHRUM AND HELLEBORE POWDERS ON DIFFERENT INSECTS. Jour. Econ. Ent. 27: 446-453.

Heavy applications of a dust containing 1.5 percent nicotine knocked down the grape leafhoppers (Erythroneura comes Say.) but did not kill them. Cultivation with a disc cultivator before leafhoppers recovered gave a satisfactory kill with the nicotine dust (p. 453).

SEVERIN, H. H. P., HARTUNG, W. J., SCHWING, E. A., and THOMAS, W.W. (2419)

1921. EXPERIMENTS WITH A DUSTING MACHINE TO CONTROL THE BEET LEAFHOPPER (EUTTETRIX TENELLA BAKER) WITH NICOTINE DUST. Jour. Econ. Ent. 14: 405-410, illus. [Abstract in Rev. Appl. Ent. (A) 10: 132-133. 1922.]

An average of 92.6 percent of leafhoppers in cages were dead in 48 hours after treatment with freshly made dust containing 10 percent of 40-percent of nicotine sulphate. It was evident that with a reduction of 84 percent of the leafhoppers in a dusted acre of beets, a marked decrease in the percentage of curly leaf would occur in isolated beet fields

SEVERIN, H. H. P. (2420)

1922. CONTROL OF THE LEAFHOPPER. Facts About Sugar, N.Y. 14 (16 and 17): 312-313 and 332-333. [Abstract in Rev. Appl. Ent. (A) 10: 396. 1922.]

Tests against leafhoppers (Eutettrix tenella Baker) with nicotine dust showed that from four to six applications were necessary to control the spring brood, but this would be too expensive in the natural breeding area.

HOWARD, F. K. (2421)

1921. NICOTINE DUST FOR GRAPE LEAFHOPPER. Calif. Cult. 56 (21): 671 and 678. [Abstract in Rev. Appl. Ent. (A) 10: 169. 1922.]

Adult grape leafhoppers (Typhlocyba comes) are so active as to avoid satisfactory contact with dusts. It is recommended that the dust contain at least 5 percent Black Leaf 40 for the control of the wingles nymphs and that from 60 to 75 percent of sublimed sulphur be added to combat mildew.

4. Heteroptera, 1921-1933

WATSON, J. R. (2422)

1925. THE CHINCH BUG ON ST. AUGUSTINE GRASS LAWNS. Fla. Agr. Expt. St Press Bull. 371, 2 pp. [Abstract in Rev. Appl. Ent. (A) 15: 588. 192

Besides using calcium cyanide against chinch bugs (*Blissus leucopterus* Say) the following are recommended. A mixture of 93 lb. hydrated lime and 7 1/2 lb. nicotine sulphate, which should be applied thickly enough to give the grass a whitish appearance; a dust containin finely ground tobacco dust with an equal weight of hydrated lime; and a solution of 1 pt. nicotine sulphate in 100 gal. water. The spread of th solution may be increased by the addition of 5 to 6 lb. soap or 1 lb. casein-lime.

ANONYMOUS (2423)

1924. INSECT PESTS IN 1923-1924. Pa. Agr. Expt. Sta. Bull. 188, pp. 16-17. [Abstract in Rev. Appl. Ent. (A) 12: 545. 1924.]

Against the apple redbug (*Heterocordylus malinus*) nicotine dust proved as satisfactory for use on the petals as nicotine spray. Two percent nicotine sulphate with dolomite or hydrated lime as a carrier was used with success.

PARROTT, P. J. (2424)

1921. CONTROL OF SUCKING INSECTS WITH DUST MIXTURES. Jour. Econ. Ent. 14: 206-214. [Abstract in Rev. Appl. Ent. (A) 9: 352-353. 1921.]

A dust containing 0.5 percent nicotine produced almost instant paralysis of *Lygidea mendax* Reut. (apple redbug) and was as quick in action as a preparation containing 1.0 percent. The apple and grape leafhoppers *Empoasca unicolor* Gill. and *Empoa rosae* L. also proved very susceptible to the same dust. Mixtures containing 0.5 percent and 2.0 percent nicotine proved effective against *Myzus ribis* L. (currant aphid) and a 2 percent nicotine mixture paralyzed the nymphs of the bug *Poecilocapsus lineatus* F.

ANONYMOUS (2425)

1929. INSECTS OF THE SEASON 1928 IN CANADA. Ontario Ent. Soc. Ann. Rept. 59 (1928): 7-38. [Abstract in Rev. Appl. Ent. (A) 18: 117-118. 1930.]

Heavy dusting with 4 percent nicotine put an end to an infestation of the green apple bug (*Lygus communis* Knight).

BRITTAIN, W. H. (2426)

1929. SOME ADVANTAGES OF NICOTINE DUSTING. Quebec Soc. Protect. Plants, 21st Ann. Rept., 1928-1929. pp.33-36. [Abstract in Rev. Appl. Ent. (A) 19: 15. 1931.]

Several years' experience in controlling the bug (Lygus communis Knight) on apples with nicotine sulphate has led the author to conclude that sprays do not give such good results as 5 percent dusts (2 percent actual nicotine) under Nova Scotia conditions. The potato aphid (Macrosiphum gei Koch) as well as other sucking insects on low-growing crops can be completely controlled by means of a dust of 4 percent nicotine sulphate used in conjunction with a canvas trailer.

WALTON, C. L., and STANILAND, L. N. (2427)

1930. THE COMMON GREEN CAPSID BUG (LYGUS PABULINUS) AS A PEST OF SUGAR BEET. Bristol Agr. Hort. Res. Sta. Rept. 1929, pp. 99-100, illus. [Abstract in Rev. Appl. Ent. (A) 18: 596-597. 1930.]

The application of a dust containing nicotine gave satisfactory results, and the affected plants subsequently made good growth.

PORTER, B. A., CHANDLER, S. C., and SAZAMA, R. F. (2428)

1928. SOME CAUSES OF CAT-FACING IN PEACHES. Ill. Dept. Registr. and Ed. Nat. Hist. Survey Bull., 17 (article 6): 261-275, illus.

A 4 percent nicotine dust killed 85 percent of the tarnished plant bugs (Lygus pratensis L.) and 90 percent of the stink bugs (Euschistus servus Say.) treated. A 5 percent dust killed 100 percent of the former bugs. A nicotine sulphate spray (1:200) plus fish-oil soap (2 lb. in 50 gal.) killed 92 percent of the tarnished plant bugs (p. 273). No complete control of these insects is at present available, and the insecticide treatments are unsatisfactory (p. 275).

FROST, S. W., and HORSFALL, J. L. (2429)

1924. ENTOMOLOGY AT THE PENNSYLVANIA STATION. Pa. Agr. Expt. Sta. Bull. 188, pp. 16-17. [Abstract in Expt. Sta. Rec. 52: 252. 1925.]

Nicotine dust consisting of 2 percent nicotine sulphate dust with dolomite as a carrier, as well as 2 percent nicotine sulphate dust with hydrated lime as a carrier, proved as satisfactory as nicotine sprays in the control of redbugs in the petal spray.

ZECK, E. H. (2430)

1933. INVESTIGATIONS ON THE GREEN VEGETABLE BUG (NEZARA VIRIDULA LINN.), 1933. Agr. Gaz. N. S. Wales 44 (8-9): 591-594, 675-682, illus. [Abstract in Rev. Appl. Ent. (A) 21: 678. 1933.]

Pyrethrum dust, with or without an equal quantity of 2.5 percent nicotine dust, gave the most promising results, killing 8 out of 16 and 4 out of 10 respectively.

GILLETTE, C. P., ET AL. (2431)

1925. SIXTEENTH ANNUAL REPORT OF THE STATE ENTOMOLOGIST OF COLORADO FOR THE YEAR 1924. Off. State Ent. Colo. Circ. 47, 77 pp., illus. [Abstract in Rev. Appl. Ent. (A) 14: 253-254. 1926.]

A 5 percent nicotine dust applied very heavily killed about 50 percent of false chinch bugs (Nysius ericae Schill.) on horse radish.

COTTERELL, G. S. (2432)

1926. PRELIMINARY STUDY OF THE LIFE-HISTORY AND HABITS OF SAHLBERGELLA SINGULARIS. Dist. Gold Coast Dept. Agr. Bull. 3, 26 pp., illus. [Abstract in Rev. Appl. Ent. (A) 14: 570-571. 1926.]

These insects attack cacao on the west coast of Africa. Nicotine sulphate has proved the most satisfactory insecticide; it is more efficient as a spray than as a dust. The formula recommended is 6 gal. water boiled with 1/4 lb. hard soap or double that amount of soft soap to which, when boiling, 1 oz. 40 percent nicotine sulphate is added. A gallon of spray will cover approximately 10 to 12 trees averaging 5 ft. in height and 30 to 40 leaves on each tree.

------- (2433)

1926. ANNUAL REPORT FOR THE YEAR 1925-26. Gold Coast Dept. Agr. Rept. 1925-26, p. 39. [Abstract in Rev. Appl. Ent. (A) 15: 23-24. 1927.]

A dust containing 7 1/2 percent nicotine sulphate (40-percent) was effective against Sahlbergella singularis Hagl. and S. theobroma Dist. on cacao where water for spraying is difficult to obtain.

THEOBALD, F. V. (2434)

1927. CAPSID BUGS (CAPSIDAE) ON FRUIT TREES. Jour. Kent Farmers' Union 21 (6): 7 pp., illus. [Abstract in Rev. Appl. Ent. (A) 15: 581. 1927.]

The control measure recommended is spraying the trees with 3 oz. nicotine (96 - 98 percent) and 4 lb. soft soap in 40 gal. water. Dusting with nicotine has also proved satisfactory, but the same precautions should be taken to prevent the return of the insects that fall to the ground unharmed.

KATSUMATA, K. (2435)

1930. RESULTS OF THE STUDIES ON SCOTINOPHARA (PODOPS) LURIDA BURM. 240 pp., illus. [In Japanese. Abstract in Rev. Appl. Ent. (A) 18: 592. 1930.]

Among control measures recommended is dusting with nicotine.

NEVSKII, V. P. (2436)

1926. CENTRAL ASIATIC EXPERIMENTAL STATION FOR THE PROTECTION OF PLANTS. Defense des Plantes. 3 (2-3): 248-251. [In Russian. Abstract in Rev. Appl. Ent. (A) 14: 610. 1926.]

The best measure against Stephanitis pyri Geoff. is spraying or dusting with nicotine.

5. Coleoptera, 1922-1933

ANONYMOUS (2437)

1923. BOLL WEEVIL CONTROL. S. C. Agr. Expt. Sta. Ann. Rept. 36 (1922-1923): 18-29, illus. [Abstract in Rev. Appl. Ent. (A) 12: 116. 1924.]

Of poisons other than calcium arsenate tested against the boll weevil (Anthonomus grandis Boh.) nicotine gave the most promising results, a 2-percent dust giving as good results as one with higher nicotine content.

LINDBLOM, A. (2438)

1930. THE CONTROL OF THE RASPBERRY WEEVIL. Flygbl. Cent. Anst. Jorbr.. Försöksv. No. 148, Landbruksentom. Avd. No. 38, 4 pp. [In Swedish. Abstract in Rev. Appl. Ent. (A) 18: 694. 1930.]

Anthonomus rubi Hbst. may be controlled by dusting with nicotine powder.

WALDEN, B. H. (2439)

1923. THE RASPBERRY FRUIT WORM, BYTURUS UNICOLOR SAY. Conn. Agr. Expt. Sta. Bull. 251, pp. 91-99, illus. [Abstract in Rev. Appl. Ent. (A) 12: 219-220. 1924.]

A dust mixture composed of 85 lb. of carrier (principally dolomite), 15 lb. dry lead arsenate, and 2 percent nicotine sulphate was used and seemed to give rather poorer results than an arsenical spray against these beetles.

GEISE, F. W., ZIMMERLEY, H. H., and SPENCER, H. (2440)

1922. SPRAYING AND DUSTING VEGETABLE CROPS IN 1922. Va. Truck Expt. Sta. Bull. 41, pp. 237-256, illus. [Abstract in Rev. Appl. Ent. (A) 12: 77. 1924.]

Two heavy applications of 3 percent nicotine dust proved successful as a repellent against Diabrotica vittata F. and D. duodecimpunctata Oliv. on young cataloupes and cucumbers, and also controlled Thrips tabaci.

HOWARD, L. O. (2441)

1922. REPORT OF THE ENTOMOLOGIST. U. S. Dept. Agr. Bur. Ent. Ann. Rept., 32 pp. [Abstract in Rev. Appl. Ent. (A) 11: 260-263. 1923.]

Against the pea aphid (Acyrthosiphon pisi) the most successful remedy has been 3/4 pt. nicotine sulphate and 8 to 10 lb. soap to 100 gal. water. Nicotine dust has proved valuable against the common cabbageworm (Pieris rapae), cabbage flea beetles and aphids, and also for Haltica litigata (strawberry leaf beetle) and in a 1.6 percent dust against the striped cucumber beetle (Diabrotica vittata).

WHITE, W. H. (2442)

1922. NICOTINE DUST FOR THE CONTROL OF THE STRIPED CUCUMBER BEETLE (A PRELIMINARY REPORT). U. S. Dept. Agr. Circ. 224, 8 pp., illus. [Abstract in Rev. Appl. Ent. (A) 11: 482. 1923.]

Details are given of experiments with nicotine dust against Diabrotica vittata F. This dust successfully protected young cucumbers, melons, and related crops.

QUINTANILLA, R. (2443)

1923. THE STRIPED CUCUMBER BEETLE. Agr. Mexicano 39 (11): 324. [In Spanish. Abstract in Rev. Appl. Ent. (A) 12: 44. 1924.]

Against Diabrotica vittata on cucumbers and melons dusting with a mixture of 6 parts by weight nicotine sulphate and 94 parts slaked lime is advised. If desired an addition of 10 percent of lead arsenate may be made. About 1 lb. of dust is needed for 200 - 300 plants.

RUSSELL, H. L., and MORRISON, F. B. (2444)

1923. ANNUAL REPORT OF THE DIRECTOR. Wis. Agr. Expt. Sta. for 1921-1922, Bull. 352, 122 pp., illus. [Abstract in Rev. Appl. Ent. (A) 11: 280-281. 1923.]

In regard to nicotine sulphate in dust carriers, nymphs of the first three stages of the squash bug Anasa tristis were killed with 4 to 7 percent, but only about 30 percent of the fourth and fifth stage nymphs and adults were killed. The first three larval stages of the potato beetle (Leptinotarsa decemlineata) were readily killed with 5 to 10 percent nicotine sulphate combined with lime or copper sulphate and lime. The eggs were destroyed, and 60 to 80 percent of the fourth and fifth stage larvae were killed. In the case of the flea beetle (Epitrix cucumeris) 1,600 individuals were killed with 4 to 7 percent; 87 to 90 percent of the onion thrips (Thrips tabaci) were killed with 5 to 10 percent; 90 to 90 percent of turnip aphids (Aphis pseudobrassicae) were killed with 5 percent; and 90 percent of the melon aphid (A. gossypii) were killed with 7 percent and all with 10 percent. The cucumber beetle, Diabrotica vittata may be controlled with a dust containing 10 percent nicotine sulphate (4 percent of nicotine). The pea aphid (Acyrthosiphon pisi) was only partially controlled with nicotine dusts.

ZIMMERLEY, H. H., DAVIS, R. J., and SPENCER, H. (2445)

1923. SPRAYING AND DUSTING CANTALOUPES. Va. Truck Expt. Sta. Bull. 45, pp. 295-313, illus. [Abstract in Rev. Appl. Ent. (A) 13: 326. 1925.]

Treatments of hydrated lime or 3 percent nicotine dust should be given at 3 to 5 day intervals, starting when the first cucumber beetles (Diabrotica vittata F. and D. duodecimpunctata Oliv.) appear. If infestation by Diabrotica is especially severe or early, 3 percent nicotine dust should be used in place of lime until the severity of the attack has passed. A heavy infestation of Aphis gossypii was effectively controlled with 3 percent nicotine dust applied with a power duster at the rate of 50 lb. per acre.

ANONYMOUS (2446)

1924. INJURIOUS INSECTS AND OTHER PESTS. Kans. Agr. Expt. Sta. Rept. 1922-1924, pp. 76-87. [Abstract in Rev. Appl. Ent. (A) 13: 27. 1925.]

Both 2.7 and 4 percent nicotine dust at the rate of 50 and 30 lb. per acre respectively, gave fair results against the pea aphid (Acyrthosiphon pisi) on lucerne. On melons and watermelons, aphids and cucumber beetles (Diabrotica) were satisfactorily controlled with a proprietary nicotine sulphate dust.

LYLE, C. (2447)

1924. CONTROLLING MELON PESTS. Miss. State Plant Bd. Quart. Bull. 4 (1): 26-29. [Abstract in Rev. Appl. Ent. (A) 12: 347. 1924.]

The simplest remedy against the striped cucumber beetle (Diabrotica vittata) and the pickle worm (Diaphania nitidalis) is nicotine dust containing 6 to 10 percent of nicotine sulphate.

SPENCER, H., and HENDERSON, H. J. (2448)

1925. THE CONTROL OF SQUASH INSECTS. Va. Truck Expt. Sta. Bull. 52, pp. 399-414, illus. [Abstract in Rev. Appl. Ent. (A) 14: 439. 1926.]

Among the control measures against springtails (Smynthurus), cucumber beetles (Diabrotica), squash borer (Melittia satyriniformis Hb.), squash beetle (Epilachna borealis F.), squash bug (Anasa tristis DeG.), pickle and melon worms (Diaphania), and aphids (Aphis gossypii Glov. are the following: dusting 3 or 4 times with hydrated lime or 3 percent nicotine dust when the plants are young, and spraying weekly with nicotine sulphate at 1 to 100.

ISELY, D. (2449)

1927. THE STRIPED CUCUMBER BEETLE. Ark. Agr. Expt. Sta. Bull. 216, 36 pp. [Abstract in Rev. Appl. Ent. (A) 16: 321-322. 1928.]

Nicodust containing 4 percent nicotine kills many beetles (*Diabrotica vittata* F.) at summer temperatures but is less effective in the spring, and the protection it gives is by no means permanent.

ANONYMOUS (2450)

1928. DIVISION OF ENTOMOLOGY. N. Y. Agr. Expt. Sta. Rept. 47 (1927-1928): 44-51. [Abstract in Rev. Appl. Ent. (A) 17: 66-67. 1929.]

The use of a 3 percent nicotine and dolomite dust in heavy dosages has been found to give the best control of the cucumber beetle (*Diabrotica vittata* Say), its efficiency, however, depending entirely on a thorough contact with the beetles. The lethal qualities of the dust were greatly increased by dry conditions. Arsenical dusts were less toxic to plant growth than nicotine dusts.

HUCKETT, H. C. (2451)

1929. A CONTRIBUTION TO THE STUDY OF CONTROL MEASURES FOR CUCUMBER BEETLES, *DIABROTICA DUODECIMPUNCTATA* OLIV. AND *VITTATA* FABR. Jour. Econ. Ent. 22: 405-411. [Abstract in Chem. Abs. 23: 3535. 1929.]

The effectiveness of nicotine-hydrated lime dust for the spotted cucumber beetle (*Diabrotica duodecimpunctata*) and the striped cucumber beetle (*D. vittata*) depends on a relatively dry environment, on direct contact of the dust with the beetle and on a heavy application of the dust.

———— (2452)

1929. CONTROL MEASURES FOR CUCUMBER BEETLES. N. Y. Agr. Expt. Sta. Tech. Bull. 148, 82 pp. [Abstract in Rev. Appl. Ent. (A) 18: 16. 1930.]

Nicotine and hydrated lime dust and bordeaux mixture (2:6:50) were toxic to the beetles as well as active repellents, but their use on the main crop as insecticides was found to be impracticable on account of the necessity for heavy and frequent applications which caused severe injury to the plants. These tests were made against *Diabrotica duodecimpunctata* F. and *D. vittata* F. on cucumbers.

BAKER, W. W. (2453)

1928. DEPARTMENT OF ENTOMOLOGY. West. Wash. Agr. Expt. Sta. Ann. Rept. for Fiscal Year ending Mar. 31, 1928, Bull. 10-W., n.s., pp. 13-16.

Against the potato flea beetle (*Epitrix subcrinita*) on potato foliage nicotine dust gave excellent results. In one case a 2 percent nicotine dust with 1 lb. of lead arsenate to 9 lb. of lime burned the foliage of tomato plants.

GENTNER, L. G. (2454)

1926. THE MINT FLEA-BEETLE. Mich. Agr. Expt. Sta. Spec. Bull. 155, 13 pp., illus. [Abstract in Rev. Appl. Ent. (A) 15: 94-95. 1927.]

Nicotine dusts containing even as much as 4 percent nicotine failed to kill mint flea beetles (Longitarsus menthaphagus Gent.).

KORFF, G., and BONING, K. (2455)

1933. THE HORSE-RADISH LEAF-BEETLE, ITS BIONOMICS AND ATTEMPTS AT ITS CONTROL. Prakt. Bl. Pflanzenbau u. Schutz. 11 (3-4): 93-100, illus. [In German. Abstract in Rev. Appl. Ent. (A) 21: 396. 1933.]

Much loss is caused to the horseradish crop in Bavaria by the chrysomelids Phaedon cochleariae F., P. cochleariae var. neglectus Sahlb., and P. armoraciae L. Dusts containing nicotine acted immediately; though some of the beetles were at first only paralyzed, they died in 1 to 2 days. Nicotine sprays caused 100 percent mortality. Dusts are easier to apply in the field and those containing nicotine or pyrethrum are preferable, because they do not injure plants or leave dangerous residues on them.

NEWTON, H. C. F. (2456)

1928. EXPERIMENTS ON THE CONTROL OF FLEA-BEETLES OF THE GENUS PHYLLOTRETA INJURIOUS TO CULTIVATED CRUCIFER CROPS. Jour. So. East. Agr. Coll. Wye, No. 25, pp. 116-140. [Abstract in Rev. Appl. Ent. (A) 16: 617. 1928.]

A spray of 0.15 to 0.2 percent nicotine sulphate and 4 to 5 lb. of free soft soap per 100 gal. applied at the rate of 30 to 40 gal. an acre, proved an effective deterrent. A dust of 2.5 percent nicotine sulphate with a kaolin base at the rate of 30 to 40 lb. an acre is effective only when applied in the presence of dew. Nicotine sulphate, especially a 0.5 percent solution, was the only spray with the exception of pure nicotine found to have any effective insecticidal action.

GLENDENNING, R. (2457)

1927. THE CABBAGE FLEA-BEETLE AND ITS CONTROL IN BRITISH COLUMBIA. Canada Dept. Agr. Pamphlet n.s. 80, 10 pp., illus. [Abstract in Rev. Appl. Ent. (A) 15: 380-381. 1927.]

By far the best remedy tried for the control of Phyllotreta albionica Lec. was a nicotine sulphate-hydrated lime dust containing 3 percent actual nicotine. This should be applied on warm days when the temperature is 70° F. or over. Three applications in spring and one or two in August should keep the pest down to negligible numbers.

________ (2458)

1928. SOME OBSERVATIONS ON NICOTINE DUST. Ontario Ent. Soc. 58th Ann. Rept. 1927, pp. 25-27.

Nicotine dust will continue to be used in hop yards against the hop aphid (Phorodon humuli Shcr.), as a combination dust of ground sulphur, hydrated lime and nicotine sulphate has been found most effective in destroying the red spider and this aphid at one operation. Nicotine dust has proved the only suitable control for the cabbage flea beetle (Phyllotreta albionica Lec.) and is being largely adopted in the lower Fraser valley as both practical and economical.

HOWARD, N. F. (2459)

1922. THE MEXICAN BEAN BEETLE IN THE SOUTH EASTERN U. S. Jour. Econ. Ent. 15: 265-275, illus.

Nicotine dusts, contain from 1 to 10 percent of nicotine sulphate by weight, gave no control (p. 273).

BENLLOCH, M. (2460)

1932. THE HALTICID OF BEET. Bol. Pat. Veg. Ent. Agr. 6 (1931), No. 23-26, pp. 69-74, illus. [In Spanish. Abstract in Rev. Appl. Ent. (A) 21: 304. 1933.]

Excellent results were obtained in experiments with a dust containing 3 percent nicotine. Dusting is preferable to spraying.

6. Diptera, 1925-1933

VAYSSIÈRE, P. (2461)

1928. CECIDOMYIA OF GRAPES IN THE CHAMPAGNE REGION. Prog. Agr. Vitic. 90: 205-207. [In French. Abstract in Biol. Abs. 5 (1): 180, Entry 1844. 1931.]

Dusting with nicotine or pyrethrum powder is suggested for Contarinia viticola Rubs.

SMITH, K. M. (2462)

1925. FURTHER EXPERIMENTS IN THE CONTROL OF CERTAIN MAGGOTS ATTACKING THE ROOTS OF VEGETABLES. Ann. Appl. Biol. 12 (1): 77-92. [Abstract in Rev. Appl. Ent. (A) 13: 159-160. 1925.]

A nicotine sulphate dust in a 5 percent mixture with precipitated chalk is the best substance against the onion fly (Hylemyia antiqua Meig.) and carrot fly (Psila rosae F.). Against the cabbage root fly (Phorbia brassicae Beh.) fairly good results were obtained with nicotine sulphate.

DOUCETTE, C. F. (2463)

1925. THE CATTLEYA FLY (ISOSOMA) EURYTOMA ORCHIDEARUM WESTWOOD. Jour. Econ. Ent. 18: 143-147. [Abstract in Rev. Appl. Ent. (A) 13: 249. 1925.]

It is suggested that semi-weekly dusting for five months be made with the following dust: kaolin 80, hydrated lime 20, tobacco dust (nicotine = 1 percent) 25, 40-percent nicotine sulphate, 5 parts.

SMITH, F. F., and FISHER, H. J. (2464)

1930. THE BOXWOOD LEAF MINER (MONARTHROPALPUS BUXI LABOU.). Pa. Dept. Agr. Bull. 13 (12), Gen. Bull. 497, 14 p., illus. [Abstract in Rev. Appl. Ent. (A) 19: 435-436. 1931.]

Brief notes are given on the bionomics and control, by sprays of molasses and nicotine sulphate, of the above insect (Rev. Appl. Ent. (A) 14: 65). The senior author obtained good control by a daily application, during the emergence period, of a dust of 40-percent nicotine sulphate and kaolin or hydrated lime (1 to 20).

DOWNES, W. (2465)

1931. HOLLY INSECTS. Brit. Columbia Ent. Soc. Proc. No. 28, pp. 25-28. [Abstract in Rev. Appl. Ent. (A) 20: 66-67. 1932.]

The best results hitherto obtained against Phytomyza ilicus Curt. have been from dusting with nicotine and lime to destroy the adults. In experiments with a 2 percent nicotine-lime dust, it was found that few flies escape, and that they begin to fall within 30 seconds. As many as 3,000 dead flies were collected from beneath a heavily infested holly tree 10 ft. high. The dust should be applied as soon as the flies appear, and satisfactory control should be obtained with 3 or more applications made at weekly intervals.

BOYCE, A. M. (2466)

1933. CONTROL OF THE WALNUT HUSK FLY, RHAGOLETIS COMPLETA CRESS. Jour. Econ. Ent. 26 (4): 819-825, illus. [Abstract in Rev. Appl. Ent. (A) 21: 602-603. 1933.]

Nicotine dust was tested, but was not so satisfactory as other dusts used.

MACKIE, D. B. (2467)

1931. ENTOMOLOGICAL FUNCTIONS. Calif. Dept. Agr. Monthly Bull. 18 (1929), No. 12, pp. 750-761. [Abstract in Rev. Appl. Ent. (A) 19; 419-420. 1931.]

As the pre-oviposition period of the walnut flies (Rhagoletis suavis completa Cress.) lasts two weeks, experiments against them were made with nicotine sulphate dust in a carrier, which killed all the flies subjected to it. In an area where applications were made twice a week for 6 weeks no infested walnuts were found.

________ (2468)

1932. REPORT OF THE DIVISION OF ENTOMOLOGY AND PEST CONTROL. Calif. Dept. Agr. Monthly Bull. 20 (1931), No. 12, pp. 745-761. [Abstract in Rev. Appl. Ent. (A) 20: 584-586. 1932.]

In the work against the walnut husk-fly (Rhagoletis suavis completa Cress.), 64,000 lb. of a 5 percent nicotine dust were applied with uniform success and no infested nuts were found in the treated area.

7. Lepidoptera, 1922-1931

ESSIG, E. O. (2469)

1922. NICODUST. Jour. Econ. Ent. 15 (3): 247.

Nicodust composed of lime treated with 5 percent and the 40 percent nicotine sulphate is proving very efficient in controlling young caterpillars, such as the leaf rollers, tent caterpillars, and cankerworms, but it must be used before the worms are half-grown.

FROST, S. W. (2470)

1931. SOME HABITS OF THE ADULTS OF THE ORIENTAL FRUIT MOTH WITH REFERENCE TO BAITS. Jour. Econ. Ent. 24: 302-309, illus. [Abstract in Rev. Appl. Ent. (A) 19: 361. 1931.]

It was found that the best method of determining the moth population of a tree was to dust it with a 4 percent lime-nicotine dust during the hottest part of the day and catch the falling moths (Laspeyresia molesta Busck) on a large white sheet beneath it.

ESSIG, E. O. (2471)

1922. THE ARTICHOKE PLUME MOTH (PLATYPTILIA SP.). Calif. Dept. Agr. Monthly Bull. 11 (5-6): 454-456. [Abstract in Rev. Appl. Ent. (A) 10: 470. 1922.]

Among sprays that may prove effective in controlling the larvae is nicotine sulphate 3/4 pt. to 100 gal. with 5 lb. fish oil soap as a spreader. Dusts suggested for experiment include 5 percent and 10 percent nicodust or nicotine dust.

THEOBALD, F. V. (2472)

1929. SOME NOTES ON INJURIOUS INSECTS AND OTHER ANIMALS IN 1928. Jour. So. East. Agr. Col. No. 26, pp. 104-116, illus. (Kent). [Abstract in Rev. Appl. Ent. (A) 17: 675-676. 1929.]

Dusting loganberries with a 2 percent nicotine gave good results against aphids (Macrosiphum rubiellum Theo.). The fly Sciara annulata Mg. can be controlled with strong nicotine and soap or with lead arsenate. The best spray to be used against the moth Plutella maculipennis Curt. consists of 4 oz. nicotine and 2 lb. lead arsenate to 80 gal. water, but nicotine dust was still more effective.

HARMAN, S. W. (2473)

1929. THE BUD MOTH IN WESTERN NEW YORK. Jour. Econ. Ent. 22 (4): 660-662. [Abstract in Biol. Abs. 5 (2): 532. Entry 5,162. 1931.]

Nicotine dusting is an important control measure against Spilonota ocellana.

COLLINS, D. L., and NIXON, M. W. (2474)

1930. RESPONSES TO LIGHT OF THE BUD MOTH AND LEAF ROLLER. N. Y. (Geneva) Agr. Expt. Sta. Bull. 583, 32 pp., illus.

Dustings were made with 3 percent nicotine-lime dust to determine the bud moth and parasite population in the lighted and unlighted areas of the orchard. These dustings indicated from 2 to 7 times as many bud moths in the unlighted area as in the lighted area. Parasites and fruit tree leaf rollers were also more numerous in the unlighted section (p. 32).

8. Thrips, Springtails, and Mites, 1921-1934

MOULTON, D. (2475)

1928. THE GRAPE THRIPS, DREPANOTHRIPS REUTERI UZEL. Calif. Dept. Agr. Monthly Bull. 17 (8): 455-457, illus. [Abstract in Rev. Appl. Ent. (A) 17: 35. 1929.]

Under very favorable weather conditions, such as still warm days, reasonable results may be expected from a thorough application of a dust containing not less than 6 percent nicotine sulphate. Where power spraying equipment is available, a spray of 1 1/2 to 2 gal. highly refined oil emulsion and 1 1/2 pt. nicotine sulphate in 200 gal. water is recommended.

WELDON, G. P. (2476)

1921. THRIPS INJURY TO PEACHES IN SOUTHERN CALIFORNIA. Jour. Econ. Ent. 14: 424-428. [Abstract in Rev. Appl. Ent. (A) 10: 134. 1922.]

Spraying with nicotine sulphate distillate emulsion mixture did not prove successful. Various strengths of Nicodust also gave negative results against this species (Euthrips tritici or possibly E. helianthi).

SORENSON, C. J. (2477)

1932. INSECTS IN RELATION TO ALFALFA-SEED PRODUCTION. Utah Agr. Expt. Sta. Cir. 98, 28 pp., illus. [Abstract in Rev. Appl. Ent. (A) 20: 679-680. 1932.]

Two applications, with an interval of a week, of nicotine sulphate in spray or dust form are recommended for control of thrips

(Frankliniella occidentalis Perg.) in lucerne fields. In tests, 4 and 6 percent home-made nicotine dust gave fairly satisfactory control of a light infestation of aphids (Macrosiphum (Illinoia) pisi Kalt.) in alfalfa fields.

McLEAN, R. R. (2478)

1931. INSECT PESTS AND PLANT DISEASES OF THE AVOCADO IN CALIFORNIA. Calif. Dept. Agr. Monthly Bull. 20 (7): 442-446, illus. [Abstract in Rev. Appl. Ent. (A) 19: 653. 1931.]

Control measures against thrips (Heliothrips haemorrhoidalis Bch.) that include the use of nicotine either as a dust or as a spray with a spreader have given the most satisfactory results, but as the eggs are not killed, two or three applications should be made at intervals of 8 to 12 days in summer, and 14 to 30 days in winter.

HOWARD, L. O. (2479)

1923. REPORT OF THE ENTOMOLOGIST. U. S. Dept. Agr. Bur. Ent. Ann. Rept. 37 pp. [Abstract in Rev. Appl. Ent. (A) 12: 165-167. 1924.]

Nicotine dust has been proved to be ineffective for the control of the citrus thrips (Scirtothrips citri). Against Dicyphus separatus (tomato suckfly) in Texas from three to five applications of nicotine sulphate dust are required. Turnip aphis (Aphis (Rhopalosiphum) pseudobrassicae) is effectively checked by nicotine dust.

SMITH, J. H. (2480)

1934. BANANA THRIP AND THE PROBLEM OF ITS CONTROL. Queensland. Agr. Jour. 40 (6): 508-524; 41 (1): 5-29, illus. Brisbane; also Bull. Div. Ent. Plant Path. Dept. Agr. Queensland, No. 9, 41 pp., illus. Brisbane. [Abstract in Rev. Appl. Ent. (A) 22: 264. 1934.]

Weekly dusting with nicotine gave fairly good control of unusually severe infestations of Scirtothrips signipennis Bagn. A dust of free nicotine and hydrated lime should be applied with a rotary duster.

HENDRICKSON, A. H. (2481)

1921. PRUNE-GROWING IN CALIFORNIA. Calif. Agr. Expt. Sta. Bull. 1328, 38 pp., illus. [Abstract in Rev. Appl. Ent. (A) 10: 213-214. 1922.]

A 5 percent strength of Nicodust is recommended for the control of the pear thrips (Taeniothrips inconsequens). For an average prune tree 1/3 to 1/2 lb. will be sufficient and the application should be made between 9:00 a.m. and 6:00 p.m. A liquid spray of 1 1/2 percent oil emulsion adding 1 pt. Black Leaf 40 to every 200 gal. has also been fairly satisfactory.

HERBERT, F. B. (2482)

1927. RAPID SPRAYING VERSUS DUSTING IN THRIPS CONTROL. Jour. Econ. Ent. 20: 665-667. [Abstract in Rev. Appl. Ent. (A) 16: 118. 1928.]

A liquid nicotine spray costs less, penetrates better and its effect persists longer than a nicotine dust. The spray consisted of 1 1/2 gal. distillate emulsion, and 3/4 pt. 40-percent nicotine sulphate to 100 gal. water, and 2 gal. were applied to each tree. The dusts (8 percent Nicodust) were applied at the rate of 50 lb. per acre. Both killed the pear thrips (*Taeniothrips inconsequens* Uzel.) on prunes in California.

ANONYMOUS (2483)

1933. ENTOMOLOGICAL INVESTIGATIONS. Nursery Market Gard. Independ. Devlpmt. Soc. Expt. Res. Sta. 18th Ann. Rept. 1932, pp. 49-57. [Abstract in Rev. Appl. Ent. (A) 21; 487-488. 1933.]

E. R. Speyer reports that the application of a dust of 6 oz. naphthalene and 0.3 fl. oz. nicotine to the floor of a glass house of 1,500 cu. ft. capacity killed approximately all the males and 80 percent of the females of *Thrips fuscipennis* Hal. and *T. major* Uzel. It also killed *T. tabaci* Lind. on *Arum* flowers almost instantaneously, and gave good results against *Hercothrips* (*Heliothrips*) *femoralis* Reut. (hothouse thrips).

O. B. Orchard reports that of numerous chemicals tested against the mycetophilids (*Plastosciara perniciosa* Edw. and *Pnyxia scabiei* Hopk), which cause serious damage to cucumbers in pots, a 0.001 percent nicotine spray was the most effective.

EVANS, J. W. (2484)

1932. THE BIONOMICS AND ECONOMIC IMPORTANCE OF *THRIPS IMAGINIS* BAGNALL, WITH SPECIAL REFERENCE TO ITS EFFECT ON APPLE PRODUCTION IN AUSTRALIA. Pamphlet Council Sci. Indus. Res. Aust., No. 30, 48 pp., illus. [Abstract in Rev. Appl. Ent. (A) 20: 601-603. 1932.]

Two propietary dusts, one of nicotine-tar and the other of pyrethrum gave satisfactory results against this thrips on apples (p. 603).

WARD, K. M. (2485)

1932. THE CONTROL OF THRIPS. RESULT OF FIELD TESTS. Jour. Dept. Agr. Victoria 30 (3): 113-117, illus. [Abstract in Rev. Appl. Ent. (A) 20: 399. 1932.]

A proprietary dust, consisting mainly of nicotine sulphate in a dolomite lime base, was applied to raspberries two or three times a week against *Thrips imaginis* Bagn. from the beginning of the flowering period to the time when the thrips had decreased to harmless numbers in the untreated plots. It caused a mortality of about 90 percent of the thrips, although the results were not regarded as satisfactory. Other dusts containing nicotine or pyrethrum also gave a high degree of mortality but were not sufficiently repellent.

OGILVIE, L. (2486)

1927. REPORT OF THE PLANT PATHOLOGIST FOR THE YEAR 1926. Bermuda Dept. Agr. Rept. 1926, pp. 35-41. [Abstract in Rev. Appl. Ent. (A) 16: 17-18. 1928.]

Some success was secured in combating a severe attack of Thrips tabaci Lind. (onion thrips) with two applications of 40 percent nicotine sulphate at the rate of 1/2 pt. to 50 gal. water with the addition of 2 lb. soap. No satisfactory results were secured with nicotine dust.

MAUGHAN, F. B. (2487)

1932. STUDIES OF THE ONION THRIPS. Jour. Econ. Ent. 25 (3): 662-670. [Abstract in Rev. Appl. Ent. (A) 20: 524. 1932.]

In tests with various materials against Thrips tabaci Lind., nicotine sprays and dusts were in general most effective.

_______ (2488)

1934. FURTHER STUDIES ON THE CONTROL OF THE ONION THRIPS. Jour Econ. Ent. 27: 109-112.

A commercial nicotine dust was applied during the day time when the temperatures were 75° F. or higher. Although the plots treated with this dust gave a significant increase in bushels of onions per acre over the untreated plots, the cost of the material practically prohibits its use.

WATSON, J. R. (2489)

1922. REPORT OF ENTOMOLOGIST. Fla. Agr. Expt. Sta. Rept. 1921-1922, pp. 56R-59R. [Abstract in Rev. Appl. Ent. (A) 11: 503-504. 1923.]

Results will more than repay the cost of nicotine sulphate in a combination spray when there are present as many as 10 thrips to a bloom. A dust composed of lime impregnated with nicotine sulphate will kill all thrips hit with it.

KRYUKOVA, F. A. (2490)

1932. COLLEMBOLA INJURIOUS TO VEGETABLES AND THEIR CONTROL. Bull. Leningrad Inst. Controll. Fm. For. Pests, No. 3, pp. 253-277, illus. [In Russian. Abstract in Rev. Appl. Ent. (A) 21: 122. 1933.]

About 80 percent of sprouting rutabagas were injured by the springtail Bourletiella hortensis Fitch (pruinosa Tullb.). In experiments with insecticides, the percentages of mortality obtained were 78 with a nicotine dust, 50 with a mixture of Paris green with ashes or tobacco dust, and 45 with tobacco dust alone.

DAVIES, W. M. (2491)

1925. INVESTIGATIONS OF SPRINGTAILS ATTACKING MANGOLDS. Jour. Min. Agr. 32 (4): 350-354, illus. [Abstract in Rev. Appl. Ent. (A) 13: 423-424. 1925.]

Of the various remedies tested the best results were obtained with a 5 percent nicotine sulphate dust equivalent to 2 percent pure nicotine. This was effective against Isotoma viridis Bourlet, Isotomerus palustris Müll., and Smynthurus viridis L., but Bourletiella hortensis Fitch dispersed to where the dust did not reach it.

BARE, C. O. (2492)

1934. ISOTOMURUS PALUSTRIS (MULL.), A SPRINGTAIL INJURIOUS TO CELERY. Jour. Econ. Ent. 27: 180.

A lowering of the water table beneath the beds to cause the soil to dry out and a heavy application of nicotine dust gave almost immediate relief in celery beds in Florida.

BRITTAIN, W. H. (2493)

1924. THE GARDEN SPRINGTAIL (SMINTHURUS HORTENSIS FITCH) AS A CROP PEST. Acadian Ent. Soc. Proc. 1923, No. 9, pp. 37-47. [Abstract in Rev. Appl. Ent. (A) 12: 496. 1924.]

In an outbreak of springtails on onions in Massachusetts in 1922, nicotine dust (2 or 4 percent) was found to kill all the insects, all except the largest being killed almost as soon as the dust touched them.

DAVIES, W. M. (2494)

1928. ON THE ECONOMIC STATUS AND BIONOMICS OF SMINTHURUS VIRIDIS LUBB. (COLLEMBOLO). Bull. Ent. Res. 18 (3): 291-296, illus. [Abstract in Rev. Appl. Ent. (A) 16: 230-231. 1928.]

A dust containing 5 percent nicotine sulphate (Rev. Appl. Ent. (A) 13: 424) has afforded control in greenhouse attacks or heavy local infestations.

THOMAS, C. A. (2495)

1931. MUSHROOM INSECTS. THEIR BIOLOGY AND CONTROL. Pa. Agr. Expt. Sta. Bull. 270, 42 pp., illus. [Abstract in Rev. Appl. Ent. (A) 20: 301-303. 1932.]

Tobacco fumigants kill a fair number of the mycetophilid flies but have little effect on the larvae in the beds. A number of commercial dusts of which the active ingredient is pyrethrum, or pyrethrum and tobacco, have been used under the same conditions, using 2.5 to 3 oz. of dust to each 1,000 cu. ft. of space. Against larvae on the casing soil, various substances, including free nicotine sprays, have been used.

Encircling the base of each post with a dust of 3 percent free nicotine and lime will prevent springtails from ascending for 3 days. After the beds are cased and before the mushrooms appear, nicotine-lime dust may be applied to the casing soil to control springtails.

STICKNEY, F. (2496)

1924. DATE PALM INSECTS. Rept. 1st Date Growers' Inst., pp. 16-17, Coachella, Calif. [Abstract in Rev. Appl. Ent. (A) 16: 69-70. 1928.]

The mite *Paratetranychus heteronychus* Ewing is easily controlled during the season by nicotine-sulphur dust or a tar-distillate emulsion. A nicotine-soap spray has been employed successfully against the date bug *Asarcopus palmarum* Horv.

THOMAS, C. A. (2497)

1934. FURTHER OBSERVATIONS ON MUSHROOM INSECTS. Jour. Econ. Ent. 27: 200-208.

A satisfactory kill of springtails was obtained by broadcasting a pound of a high nicotine content fumigating powder over the surface of each 60 foot bed. Nicotine also kills many adult phorids and other dipterous larvae on the bed surface. Nicotine dusts have value against the sciarid flies, but are still in the experimental stage. Strong nicotine dusts in actual contact with adult mites of *Tyroglyphus lintneri* Osborn will kill many of them.

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